THE
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THE INTERNATIONAL EXHIBITION AT TURIN.

THE Exhibition at Turin, while disappointing to our national pride in several particulars, affords ample satisfaction in other respects. The Exhibitions Branch of the Board of Trade, which made its first appearance at Brussels in the co-ordination of exhibits, and in securing the support not only of important, but of organised, sections of British trade, has, at this second exhibition on the Continent, done even better. Those who read our remarks about the Brussels Exhibition will remember that we then indicated one or two administrative features as capable of improvement. In the preface to our notes on the exhibits themselves, which will appear in a later issue, we deal with these. At this juncture, however, we wish to deprecate the apathy of the British electrical manufacturer. Our showing, save in regard to electro-physical apparatus, is paltry in the extreme. In high-class scientific apparatus the British display is admirable, and has attracted considerable attention, demonstrating beyond doubt our national ability to take a leading part in practical electrical research. In this column it would be invidious to single out the name of any manufacturing firm, but we cannot withhold our highest praise from the firms showing in this section. Under Dr. Glazebrook's guidance, the exhibits of electrical apparatus from the National Physical Laboratory, reinforced by exhibits from instrument-making firms, form a special feature, not only of the British Section, but of the Exhibition as a whole. One can only compare it with that superb, but all too short, exhibition of apparatus required in the laboratory of a modern steel works which followed Sir Robert Hadfield's "James Forrest" Lecture at the Institution of Civil Engineers several years ago.

But apart from this, the British electrical display, or rather its absence, is a standing memorial to short-sighted ineptitude. The impression conveyed to the visitor is that we are able to make a few small motors, and nothing more. There is no indication in regard to switchgear, for instance, that we have ever made anything for more than a 500-volt service, save some leaflets printed in English only of some 10,000-volt material. The largest generators shown are only in the neighbourhood of 100 KW. These, moreover, are belt-driven by internal combustion engines. Whereas French, German and Swiss firms show extra-high-tension switchgear and insulators for duties up to 100,000 volts, our Commissioner was unable to find any British-made oil-break switchgear at all. We had imagined that Great Britain had had more than a little to do with the development of the turbo-generator, yet Continental firms showed these up to 5,000 KW. with not so much as the exhibition of a blade by a British firm. Again, take cables both for mains and for house wiring. Here the cable maker will indignantly remark that it is universally known that Italy is a country of overhead

distribution, and that, with regard to house-wiring, twin flexible carried on insulators is common practice, so that under these conditions the market for first-class VIR, or lead-sheathed paper-insulated cables, is not worth seeking. Yet if any member of the C.M.A. visited Turin, he would see Continental cables exhibited, and find even that Continental firms who were not exhibiting had sent representatives to Turin to feel the pulse of the market.

Just as underground cables are replacing a great deal of the overhead work in American cities, so in Italy and the adjacent countries the demand must certainly arise in time for permanent material to take the place of the temporary. What we have said about cables applies with greater force to tramway overhead material, for in this case the day of replacement of flimsy by solid articles cannot be far distant, if excessive activity on the part of tower wagons in Turin is any criterion.

Leaving for the moment engineering matters, we have nothing but praise for those exhibits representative of the greatest technical skill in other branches of British manufacture. Whether it be photography, or woollen goods, or decorative textiles, or cut-glass, or ceramics, or book printing and binding, we have at Turin organised displays, arresting in their uniform dignity, and compelling attention alike for artistic conception, for delicacy of finished craftmanship, and for solidity. The Bradford Chamber of Commerce not only shows its finished products, but in a series of nine tableaux exhibits the chief stages of manufacture, sorting, combing, spinning, weaving and dyeing from the raw material to the finished costumes. The latter, indeed, cover three stands, representative of garments for Henley, for a shooting party, and for the opera at Covent Garden. Why have not our electrical manufacturers done what has been done for the British automobile industry by the Society of Motor Manufacturers and Traders, who have organised a display of British-made motor-cars? On first thoughts one would have considered that the organisation of such a sectional exhibit in a city which has within its borders no fewer than 14 factories devoted to the automobile industry (one of which has a very high reputation in London), was a piece of magnificent but futile assertion. Yet the display has attracted wide interest, and several of the cars have found Italian purchasers.

Or, again, we could cite the excellent exhibits of British agricultural machinery, and two good displays of internal combustion engines, and two of machine tools. So far as machinery in motion is concerned, the small British display is very good of its kind.

In the railway section there is not a square millimetre of space devoted to British products. Germany, France, Italy and Belgium show some superb locomotives, high-class passenger rolling stock, mineral wagons, and electric locomotives. These exhibits are practically left to advertise themselves, and it was impossible for our Special Commissioner to obtain information. Generally the attendance of exhibitors' representatives at German stands is poor, and also at some Italian stands. Other Italian stands are well staffed. Perhaps most attention is paid to the visitor in the French and British sections. The French official catalogue is the best of the sectional catalogues in the whole Exhibition. The British catalogue is published in English and French, and exhibits in British showcases are invariably described in two languages—English and Italian, and often a third description in French appears. The German catalogue is published in German only, and the items on the stands are very indifferently described. One good point is common to both the British and American organisations, and that is that the custodians looking after groups and showcases have seats and desks. The American custodians were not very efficient, and seemed (when they were visible) to be chiefly interested in reading American papers. The British custodians were alert, and always bi-lingual, and occasionally tri-lingual. The Swiss exhibits are fairly good.

In heavy central station machinery—turbines, Pelton wheels, Diesel engines, and materials for high-pressure transmission lines—our Continental rivals make an interesting display. From these, and from a study of those of the Italian State Railways, which are electrically operated, there is much to be learnt. Our own conditions are such that we have not yet had, and it is debatable whether we shall have, to construct 100,000-volt transmission lines in Great Britain. We might do a little with the Pelton wheel. Both will be required in the Colonies. Ought we not to fit ourselves for such work? The Diesel type of engine we have already taken up. But one would have thought that in regard to so purely British a conception as the steam turbine some showing might have been made.

We hope that the Turin Exhibition will be the last occasion on which we shall have to deplore the almost total absence of British electrical exhibits. If France, Germany and Switzerland, faced with heavy railroad charges, think it worth the expense to exhibit on such a large scale, it ought to be worth our while to make a bid for the trade which they seem so confident of securing.

The Competition for Street Lighting.

The superiority of the electric light, whether as regards the excellence of the illumination or its economy, has become so manifest since the introduction of the metallic-filament lamp, that the gas companies have to rely for the maintenance of their long-continued monopoly upon exceptional circumstances, rather than sound commercial principles.

They have in their favour the being, in most cases, in possession, mains laid and the business well established under contracts for more or less long periods. Local gas companies undertake the supply, and to a large extent the shares held locally are frequently in the hands of members of the local authorities, whose interest is naturally in favour of securing dividends upon their investments.

In the majority of cases, no electric supply is yet available in many small towns and villages, although the growth of power companies supplying electricity over wide areas by long-distance transmission will gradually fill these requirements by the establishment of local works for distributing the current.

In but few towns where electricity is available have mains been laid throughout the public thoroughfares, so that the only practical competition is limited to portions of the roads and streets; this gives the gas companies a present monopoly. But when the local authorities recognise the great advantage of lighting by the "up-to-date" system, contracts will be offered for sufficiently long terms to warrant the outlay of capital on mains; otherwise they must wait until the gradual extension of the use of electricity warrants putting them down throughout the towns.

In the meantime it is interesting to note the struggles of the gas interest to hold their own in the competition that can have but one result in the "survival of the fittest."

Among the most recent cases is that of the town of Lewes, where an electric supply has been available for 12 years; among the first customers of the company were the present Mayor, Mr. Alderman Holman, and a former Mayor, Mr. Alderman Gates, both of whom certified as far back as 1902 that they found it cheaper and better than gas. The company have, therefore, always had influential supporters in the Corporation, but until the present year have had no chance of obtaining a contract for street lighting.

In June last tenders were invited from the gas and electric supply companies, with the result that the Highways

and Works Committee recommended the acceptance of the tender of the electric in preference to that of the gas company.

The respective tenders were reported upon by the borough surveyor. The cost of lighting by gas was £447 15s. 6d., and by electricity £390 5s., showing a difference of £57 10s. 6d., equal on the five years' contract to a saving of £287 12s. 6d.

Apart from this actual economy in cost, the lighting by electricity was better, and Councillor Fowler, in the discussion upon the recommendation of the Committee to enter into the contract with the Electric Lighting Co., put the position into the proverbial nutshell when he said that "the Committee went carefully into the matter, and were thoroughly conversant with the details. They could not get away from the fact that electric light was cheaper, and gave a better light than gas. This was a matter in which members of the Council should look beyond their own interests, and consider the interests of the general body of ratepayers." In spite of these facts, an amendment to the recommendation of the Committee was carried by 10 votes to 6.

Before the vote was taken a significant question was asked as to whether shareholders of the gas company were entitled to vote, and the town clerk advised the Mayor that, "as no actual change was involved, shareholders could vote."

The terms of the amendment, as originally proposed and discussed, were "that the tender of the Lewes Gas Co. as to the 127 lamps be accepted as from September 29th next; and that such company be approached as to their future charge for the other 167 street lamps in the town"; but the mover (Councillor Verral) ultimately agreed to substitute words to the effect that the recommendations of the Committee be referred back for further consideration.

We do not know how many of the members of the Council who voted against the recommendation of the Committee to accept the tender of the electric supply company were shareholders in the gas company, and it would be interesting to know if they were sufficient to turn the majority of 4 into a minority; but in any case, we question the legality of their votes, as it is perfectly clear that they were voting as shareholders in the interest of the gas company.

The reasons given by the speakers in favour of giving the contract to the gas company, notwithstanding that it was opposed to the interests of the town, are curious.

For instance, Councillor Verral, who moved the amendment, argued that the gas company had not been treated in a proper manner, because their manager called upon the town clerk, the borough surveyor and the chairman of the committee, but was unable to ascertain particulars of the Council's requirements; but the gas company made a formal tender under similar circumstances to that of the electric company.

Another reason was that the gas company paid more in rates than the electric company; but he let the cat out of the bag when he argued as a reason for paying more for an inferior light that *a great number of the shareholders of the gas company were Lewes people.*

But the most extraordinary argument was the assertion that the Board of Trade had power to revoke the provisional order of the electric supply company, if they did not pay dividends! And if they stopped the electric light company, where would the town be in regard to public lighting if the Committee's recommendations were adopted?

He trotted out the venerable mis-statement that at Brighton Railway Station, Westminster, Holborn, Paddington and a comprehensive "other places," gas had superseded the electric light, which scarcely required the counter-blast of Councillor Savage, who was prepared to give the names of at least nine places that had adopted electricity since last March.

The reference to Holborn was a specimen of the apparent ignorance on the part of such advocates of the gas interest, as Councillor Verral was evidently unaware of the fact that for the street lighting of that metropolitan borough the gas and electric companies had combined, and made a joint tender for lighting the streets partly by gas and the remainder by electricity, an arrangement which indicates a policy of lighting by electricity where the company's cables are laid, and by gas where there are only gas mains. Under this plan of operation the joint interests of the rival systems are preserved and the cutting of rates is prevented.

It is the general interest of the ratepayers that ought to be the chief consideration of the Town Councils, but in cases like that of Lewes, it is clear that neither economy nor efficiency has been allowed to interfere with the personal gains of shareholders in the gas company. This is a matter which, doubtless, the inhabitants will bear in mind when the selection of their representatives next takes place, and meanwhile, perhaps, on the *reconsideration* it will be decided to adopt the proposal of the special committee and to accept the electric company's tender.

In considering the respective merits of electricity and gas for street lighting, it is essential to have regular tests made of the candle-power of the lamps, as it is well known that the gas mantle deteriorates so rapidly that after a few weeks the illumination is considerably reduced, whereas there is little or no reduction in the light of the metallic-filament electric lamps during a period of 2,000 hours.

In an article upon "Street Lighting by Modern Electric Lamps," in our issue of December 9th last year, the result of tests of the gas and electric lamps at Sheerness was given, and this should be studied by every local authority dealing with the public lighting question. The gas burners rated at 80 C.P. in no case averaged as much as half that value, whereas the electric lamps rated at 50 C.P. averaged in one street 53, in another 51·5, and in no case below 50.

After a high wind, which did not affect the electric lamps, the gas mantles were described as "ragged and tattered apologies"!

Atlantic Cable Amalgamation.

THE issue of circulars mentioned in our last issue with regard to the leasing of Atlantic cables seems to raise certain important points for consideration. The pioneers of Atlantic cable enterprises were chiefly British, and the danger of loss of the ownership and control of these British undertakings is shown by the expansion of German, Dutch, French and American lines. The manufacture of submarine cable, at one time practically a British industry, within the last 10 years has, to some extent, gone to Germany and France, and must reasonably be expected to go to the States when full American control is established of the most important lines of communication in the whole world. The value of telegraphic communication for diplomatic administrative and defence purposes does not appear to be secured by the provisions under the terms of the lease that the working staff shall be British; and the use of cables is not necessarily greatest after war is declared, and so long as a cable is controlled, the work must be subject to the direction of leaseholders and subject to scrutiny and censorship from any point on other than British territory. Whether the Sherman (Anti-Trust) Law will be infringed when a full and effective lease has been approved does not seem problematical if there was any objection to the previous pooling arrangement, and it seems to require some greater knowledge to understand why an agreement should be made while this question remains unsettled. In the event of the agreement falling in, there does not appear to be any provision made for the repayment to the Anglo Co. of the purchase price of the Western Union Cable, and if after some years this should occur, after the canvassing has been in the hands of others, we wonder what will be the chance of the Anglo Co. regaining their old position.

We do not yet see that it is necessary that the complete operating control of all these companies should be necessary to perform a homogeneous and expeditious service. It has always been well known that the managers of the Anglo Co. have little to learn, and seeing that in Great Britain, it is within the power of senders of telegrams to route them by whichever system they choose, so that foreign and British systems have equal facilities and all companies have alike the liberty to open receiving offices in the United Kingdom, and rent lines or hand telegrams to the Post Office without any restriction, it seems strange that British cable companies have not to-day the same facilities in the United States.

THE INTERNATIONAL CONGRESS OF APPLIED ELECTRICITY AT TURIN.

By our special commissioner.

The Opening and General Meetings.

Overlapping the closing stages of the International Electrical Conference at Turin, but possessing no administrative functions, came the meetings of the International Congress of Applied Electricity. It must be confessed that the number of English delegates was small, and that even of those registered as subscribers to the Congress several were not able to get over to Turin. Among those present our representative noticed Mr. Alexander Siemens, Mr. Robert Kaye Gray, Colonel Crompton, Mr. Duddell, Major O'Meara and Mr. Rowell. (Some of the incidents of printers' errors were amusing; for instance, Mr. Major W. A. J. O'Meara, London, and Ing. Kinellim Edgumbe, London, and Mr. R. S. Glazebrock, Teddington).

The Congress opened at 10.30 a.m. on September 10th, when Signor S. E. Boselli, the chief of the Royal Polytechnic School (in whose rooms the Congress held its meetings), delivered the inaugural address. He greeted the members of the Congress in the name of the Italian Government, and recalled the traditions of the building in which they met, created by the school of Galileo Ferraris, which was continued by his successors. He referred to the paramount importance of their investigations, and mentioned that he was himself keenly interested, in his capacity as a Minister of the Crown, in the relations between the State and electrical undertakings. (Those relations in Italy, we would note in passing, cover a heavy tax on landowners whose water-power is utilised in the generation of electrical energy. It would be akin, of course, to a tax on each ton of coal mined in a coal-producing country.) Continuing, Signor Boselli expressed his warmest wishes for the success of the Congress and the development of applied electricity.

Prof. Lombardi, the president of the Organising Committee, also welcomed the delegates, and referred briefly to the origin of the Congress and the labours of the sectional committees. He referred to the great progress made in Italy—poor in fuel, but rich in water-power—and her aspirations to occupy therewith a leading place among the nations. He invited the members of the Congress to visit the more important of the Italian installations, or, if this was impossible, at least to examine their fundamental characteristics, concerning which various publications would be presented to each member. Much of the success of the Congress was indirectly due to His Royal Highness the Duke of the Abruzzi, who had graciously extended his patronage to their labours, to His Excellency Signor Calissano, who would deliver an inaugural address, and to the Ministers of the Interior, of Agriculture, Industry and Commerce, of Education, of Public Works, of the Army and of the Navy who had sent delegates to the Congress. After thanking Prof. Grassi and Signors Lignana, Nizza and Luino for their assistance, Prof. Lombardi thanked their two secretaries, Signors Curti and Semenza, in particular the latter, for their invaluable work. He then called upon His Excellency Signor Calissano, Minister of Posts and Telegraphs, to open in the name of the King the second Congress of the Applications of Electricity.

Signor Calissano, in the course of a speech which was widely applauded, referred to the great importance of the subjects they were about to consider, and claimed that in this field, Italy was not inferior to other countries. In the name of Signor Nitti, the Minister of Agriculture, Industry and Commerce, he presented to the Congress a volume of statistics of Italian electrical installations which would indicate the enormous progress made in Italian electrical work during the past 10 years. He also referred to the progress made in telegraphy and telephony, and mentioned the approaching conference at Rome on wireless telegraphy.

Speeches were then made by leading delegates, and honorary presidents and honorary vice-presidents were appointed. Amongst the latter were Mr. Alexander Siemens and Prof. Silvanus Thompson. The following sectional officials were appointed :—

Section.	*President.*	*Vice-Presidents.*
1. Electrical machinery and transformers.	Boucherot (France).	Morelli (Italy). Feldmann (Holland).
2. Installations, central stations, power supply.	De Bast (Belgium).	Ferraris (Italy). Landry (Switzerland).
3. Instruments and methods of measurement.	Kennelly (U.S.A.).	Dina (Italy). Armagnat (France).
4. Illumination and electric heating.	Rossander (Sweden).	Mengarini (Italy). Sharp (U.S.A).
5. Electric traction.	Mailloux (U.S.A.).	Sartori (Italy). Barnet Lyon (Holland).
6. Telegraphy and telephony.	O'Meara (England).	Larsen (Denmark). Di Pirro (Italy).
7. Accumulators, electrochemistry and electrometallurgy.	Beckman (Germany).	Nuolati (Italy). Duddell (England).
8. Tariffs, taxation and electrical legislation.	Arno (Italy).	Dettmar (Germany). Banghi (Italy).

The first general meeting was held on September 13th, when the President of the Congress, Prof. Lombardi, was in the chair. The President, in opening the proceedings, spoke solely on the subject of the organisation of future Congresses of Applied Electricity. He reminded the meeting that in 1908, when a Congress of Applied Electricity was held at Marseilles, the proposal was made to constitute an International Commission for the purpose of organising electrotechnical congresses. The provisional Commission then nominated, however, arrived at no conclusion on the subject.

However, when the official meeting of the International Electrotechnical Commission was held at Brussels, in 1910, it was agreed that this Commission would undertake the work of organisation. The present Congress was actually undertaking the organisation of local committees of this same Commission. The President concluded by saying that he considered the time had come to adopt some definite resolution.

M. Feldmann, saying that the International Electrotechnical Commission should undertake this work, proposed a resolution to that effect.

Prof. Silvanus P. Thompson, Messrs. Mailloux, L'Hoest, Stecker and De Chatelain spoke in support of M. Feldmann's resolution on behalf of the countries which they represented. M. Boucherot also agreed to the proposal, and Prof. Grassi, in the name of the Executive Committee of the Congress, pointed out that in the Congress of Turin, this arrangement had already come into effect. M. Feldmann's resolution was then carried unanimously. It is, in detail :

Considering that the provisory Committee named by the International Congress of Applied Electricity at Marseilles, with a view to forming a permanent International Commission for the organisation of Electrotechnical Congresses, did not present any resolution ;

And seeing that the International Electrotechnical Commission regularly constituted since 1906 is indicated by its composition, authority, and statute, as the proper permanent organisation to assure continuity of the International Electrotechnical Congresses, and so give effect to the work done by them :

"The Congress decides to ask the International Electrotechnical Commission to accept the task of organising future Electrotechnical Congresses, both as to the times and places where they are to be held, and as to their object, the task of the details of organisation of each Congress being confided to the National Electrotechnical Committee of the country in which the Congress will be held, with the assistance of the technical societies of those countries, if any."

At the final meeting on September 15th the following resolutions, already adopted by the various sections, were put to and carried by the Congress as a whole :—

Section III.—By Prof. Grassi, a resolution congratulating the American Institute of Electrical Engineers on its practice of quoting in all its publications the metrical equivalent of any value expressed in English units, and expressing the hope that the Societies of all countries where the metrical system was not in universal use would follow its example.

Section IV.—A resolution (originally proposed by Mr. Gaster) that an International Commission be appointed to study all the systems of illumination and all the technical questions relating thereto, and that the Illuminating Engineering Society of London be requested to form this Commission, and enter into relations with the other photo-

metric Commissions, national and international, at present existing.

Section V.—A resolution by M. Donati, determining a standard expression for the acceleration of trains, &c., viz. :—That the acceleration of trains be expressed in kilometres per hour per second (quoting the Marseilles Congress of 1908 in support of this definition).

Section VIII (first resolution).—In order to simplify the carrying-out of installations involving large networks of distribution, a resolution recommending :—

1. That in drawing up laws on the subject the technical side be kept entirely distinct from the legal.

2. That the technical side be revised by a permanent Electrical Council in each State.

3. That every State should compile laws, which, without interfering with the powers of local authorities, shall facilitate the installation of electrical concerns involving large networks, avoiding obstruction either through objection to work being carried out, or to necessary sales, by the local authorities.

Second Resolution.—For the better regulation of taxation of electrical concerns, formulating the principle that electricity for lighting purposes only should bear taxation :—

1. That the State declares untaxable the production and sale of electrical energy, with the exception of private lighting.

2. That such taxes be applied in such a way as not to cause electric lighting to be in an inferior condition in comparison with other methods of illumination as regards the consumer, and not as regards production, permitting the undertakers to supply to the consumer without being subject to loss or hindrance in such service on account of the State.

3. That the contribution to the local authority be not left to the decision of such authority, but be according to a State regulation, and cannot exceed a reasonable amount.

4. That the financial statistics be made out in agreement with the customs of the industry, and are furnished with all details which will render them useful as records.

(These last resolutions are, of course, due to Italian fiscal conditions, which impose an annual tax on all undertakings generating electricity.)

The deliberations of the Congress, as a whole, were concluded by the customary votes of thanks. To these formal tributes our representative would add his own special appreciation of Signor G. Semenza's courtesies during a rush of overwork amounting almost to an avalanche.

FACTORY LIGHTING.

By CECIL TOONE.

Good lighting, both by day and by night, is as important to the factory worker as proper ventilation and sanitation of his workroom. Consciously and sub-consciously, the nature of the lighting provided affects both his will and ability to work, and the fact that artificial lighting is generally used for a comparatively few hours per week is no excuse for the least neglect in its provision. In the average factory, artificial lighting is required at those times when the workers most need, and most benefit by, proper illumination. Yet, while deficient lighting leads to accidents and mistakes and to various eye troubles (such as myopia), it must be remembered that excessive intensity of illumination is equally injurious. The minimum and sufficient condition is always that sufficient light be provided of such quality and distribution that all desired operations can be carried out with minimum fatigue and cost and with maximum safety and excellence of results.

Whenever available, daylight is far preferable to artificial illumination, not only on economical grounds, but also by its invaluable germicidal powers and beneficial effects on the health and spirits of workers. Nevertheless, very inadequate provision is commonly made for the natural lighting of workshops, and in no case is the daylight illumination necessarily a standard on which to base the design of artificial lighting equipment. The provision of "high angle" daylight is very desirable; increasing the height of wall windows by 1 ft. (at the top), may increase the total daylight illumination of a workshop by 50 or 100 per cent. From the illuminating standpoint, single-floor workshops lighted by "skylights" are preferable to all others; the provision of sufficient, suitable natural illumination then offers no difficulties, and the problem of even artificial lighting is usually simplified (though diffusion from walls and ceilings can now be utilised to a very limited extent). The use of prismatic windows for improving the central lighting of shops dependent upon wall windows is liable to lead to intense local reflection of light in some directions.

In designing an artificial lighting installation for workshops, one of the first points to be decided is whether "general" or "local" illumination is to be provided. Sufficient "general" illumination is, in any case, essential to avoid too great contrast between adjacent areas, to facilitate general attention to machinery, and to enable adequate supervision and safe passage from part to part of the shop. Thus far there can be no dissentients, but, whereas some authorities advise a sufficiently high general illumination to render all "local" bench lamps unnecessary, others prefer a moderate general illumination augmented by local lighting over each machine tool. In the writer's opinion a purely general lighting (derived from high-slung flame arcs or H.T. mercury vapour lamps*) is best for foundries and all shops where no specially fine work is in progress, while a high general illumination, augmented by comparatively small local lamps, is best for detail machine shops. Generally speaking, in shops where the old-fashioned, haphazard, usually deficient lighting system has been discarded, there is a tendency to provide too low general lighting and too intense local lighting.†

Local "drop" lamps over machine tools give a slovenly appearance to a workshop, and the loose wires may easily become a grave source of danger, particularly where there is much overhead shafting and belting. In any case, there should be no bare lamps in the direct line of vision of any worker, and employés should not be given unrestricted control over any local lamps which may be installed, or they will invariably draw them as close as possible to their work, thus destroying the efficacy of any special distribution of light which may have been arranged; hampering their movements possibly to a dangerous extent; heating their eyes, and working under too intense an illumination. Further, they will probably inconvenience their neighbours by subjecting the latter to directly incident light. To avoid direct vision of unshielded lamps is an easy matter in lofty shops; but in low rooms, lighted by metallic-filament or mercury vapour lamps, diffusing globes or inverted lighting must be adopted.

Tolerably even illumination over the whole of a workshop favours minimum eye fatigue, and enables maximum accuracy of perception, while reducing the actual lamp candle-power required. On the other hand, it is extremely necessary to have a correct appreciation of relief, hence too uniform illumination by indirect lighting, and multiple shadows cast by a number of exposed lamps, are alike unsatisfactory. The best all-round results are attained by the use of combined diffusing and indirect lighting fittings. All walls and ceilings should be periodically whitewashed to take full advantage of the excellent diffusion thus enabled.

Polished reflectors should be avoided except for very special purposes, the cheaper types invariably giving streaky and irritating results. Such a wide adoption of the "Holophane" class of fittings as is found in America has yet to be realised in English factories, but simple enamelled reflectors and opalescent globes of good quality have many more virtues than are often admitted.

The direct reflection of light from bright metal work should be carefully avoided. The reflected intensity of even dull steel may easily exceed 1 or 2 candle-feet, so that

* It is tacitly assumed that electric lighting is employed. The only possible advantage of gas over electric lighting, in the present connection, lies in the total working cost, and, while not admitting that a comparison on this heading is at all favourable to gas, it is shown below that the cost of electric lighting is so small as compared with the wages bill of a works, that the monetary aspect may be neglected in favour of more important considerations.

† By the misapplication of "local" lamps, it is quite possible to obtain a range of illumination at various points of 20 or 40 : 1 over a 7-ft. bench.

the component parts of all machines should, as far as practicable, be painted a matt grey or green. For a similar reason, bare lamps should not be suspended directly above any pools or tanks of oil; though the lamp itself be out of the direct line of vision, the intense reflection from the oil is annoying and harmful. All work involving the handling of bright metal parts, varnish, or other reflecting material, requires specially careful illumination.

The proper inspection and maintenance of a lighting equipment is no less important than its initial design. Diffusing globes as at present used seldom absorb less than 15-30 per cent. of the light emitted by the contained lamp (this figure falling to 10 or 15 per cent. for prismatic globes), even when thoroughly clean, and the collection of dirt on globes and reflectors may easily cause a further loss of efficiency of 15-30 per cent. Periodical inspection and cleaning thus becomes essential to maintained efficiency; the cost of such special attention may be reduced by encouraging each workman to keep clean his own "local" lamp and fittings. Frosted and prismatic glassware is specially favourable to the collection of dirt, particularly in damp and oily situations.

The very faulty lighting provided in innumerable factories naturally excites the casual observer to a demand for legislation on the subject, but the difficulty of subjecting, to even the broadest regulations, conditions which depend so essentially on individual circumstances will be at once patent to all who have had any practical experience of illuminating problems. Indeed, if manufacturers would only realise the great benefits inseparable from a well-designed lighting installation, and the relatively low cost of providing and maintaining the latter, legislation would become as unnecessary as it must now be ineffective. Thus, the cost per hour (at 2d. per B.T.U.) of providing :—

25 50 100 200 candle-power per man
= 0·075d. 0·15d. 0·30d. 0·60d. using lamps requiring 1·50 w./C.P.
or = 0·025d. 0·05d. 0·10d. 0·20d. using lamps requiring 0·50 w./C.P.

Assuming so liberal an allowance as 100 C.P. per man at 1·25 w./C.P. and 2d./B.T.U., the cost of energy for lighting is ¼d. per hour, and if the worker's wage be 1s. per hour, an increase in his output of about 2 per cent., due to the excellent lighting provided, will fully cover the energy cost of the latter. If only 16 C.P. had been provided by carbon lamps (at 3½ w./C.P.), the energy cost per hour would have been 0·11d., so that an increased output of only 1 per cent. would pay the additional cost of the improved lighting first assumed.* Taking the overall cost of a well-designed lighting installation, employing flame arcs, mercury lamps or m.f. units, the net cost of lighting per worker is considerably less, and the ease of recovery by improved output correspondingly greater, than shown by the above example.

For the handling of light coloured or large articles or goods, an illumination of 2½-4 ft. candles should be provided; where dark goods or fine work is concerned, from 3-5 ft. candles is necessary, and 10 ft. candles is (subject to proper distribution) not excessive; 50-100, or even 200 ft. candles is often provided near the working centre of various machine tools, but such an allowance is excessive and injurious. Under favourable circumstances, an engineering workshop may be satisfactorily lighted by metallic-filament lamps by the expenditure of 1·0-1·3 watts per sq. ft. of floor area, but, under unfavourable circumstances, from 1½-2½ watts per sq. ft. may be necessary. In a certain American typewriter works covering 13 acres floor area, and employing 8,000 workers, the average power expenditure for lighting is 1·03 w./sq. ft. floor area, or 73 watts per employé.

In textile mills and similar applications, the correct appreciation of colour values is usually of great importance, and in such cases D.C. open arcs burning unimpregnated carbons give very satisfactory results. In a general engineering factory the colour of the light employed is only of importance in so far as it affects the visual acuity of workers and the quality of their output; the psychological effect of colour is then of the greatest importance.

The effective illuminating power of any light depends fairly closely on the yellow component of the latter (on this fact, Crova bases his system of colour photometry), and roughly 87 per cent. of the effective luminosity of white light lies between the scarlet and deep green lines of the spectrum. Deep red light has a high power equivalent and is very liable to cause retinal burning, while the irritating effects of ultra-violet rays are well known (no light containing the latter should be used without a lead-glass screen).

According to Steinmetz, the illuminations at which various colours just cease to be visible are as follows :—

	Metre-candles.	Relative power radiation.
Red	0·06	10,000
Orange ...	0·0056	1,000
Yellow ...	0·0029	100
Green	0·00017	1
Blue	0·00012	2
Violet	0·00012	20

—a result which clearly favours a greenish-blue light as being of maximum illuminating value while having minimum power equivalent. The low-voltage (Cooper-Hewitt) mercury arc gives such a light, and is undoubtedly of high illuminating value. On the other hand, the psychological effect of this ghastly light is very depressing, and it seems perfectly reasonable to argue that our eyes, which have been developed by nature for use in white light, cannot be otherwise than injuriously affected by prolonged exposure to a radiation consisting almost entirely of colours in which daylight is notably deficient.

Probably as a result of the latter fact, the pupil contracts very little when exposed to blue or green rays, and the retina is thus exposed to a far greater energy absorption than would appear possible from the above data. Owing to this lack of natural protection of the retina, excessive illumination by the mercury arc is specially dangerous. The quartz and silica high-preesure mercury lamps are much superior to the earlier Cooper-Hewitt patterns, and it is at least open to question how much of the popularity of the latter, with some of its advocates, is due to *(a)* its weird novelty, and *(b)* the very inferior nature of the equipment it replaces.

Most persons feel most cheerful and natural under a white or yellow illumination, and such should, therefore, be preferred for the general lighting of factories. Workers should be conscious of nothing unusual in their surrounding illumination, and the more closely artificial lighting approaches efficient natural illumination in distribution and value, the more satisfactory should the former be deemed.

The arrangement of all lighting facilities—whether for natural or artificial lighting—should be guided solely by illuminating considerations. Ill-planned work, arranged to suit the contractor's convenience, has undoubtedly been responsible for the adoption of one or the other form of gas lighting in numerous cases, but recent equipments show that the folly of subordinating the permanent worth of an installation to considerations of temporary convenience at the time of its erection, has at last been widely realised.

* As at present available, the renewals cost of metallic-filament lamps is little, if any, higher than that of carbon-filament types; from 2,000 to 3,000 hours' life can be confidently expected for the former.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Rail Corrugation.

In your issue of September 15th, I notice that Mr. Worby Beaumont, in his recent address on the subject of rail corrugation, stated it as a general axiom that corrugation occurs with all types of trucks. This is just one of those sweeping statements which seem to me to divert the study of corrugation from its proper direction. What is the outcome of Mr. Beaumont's investigation of this subject? It seems to me that he has studied only the materials on which the corrugations make themselves apparent. I have no desire to criticise his work in so far as it is confined to those materials. I do say that the remedies he proposes are impracticable ones, and what I shall probably not be alone in objecting to is that he attempts to close every other avenue of investiga-

tion. The whole appearance of the marks called corrugation suggests to my mind the action known as chattering. Yet if chattering occurs on a piece of steel which is being turned on a lathe, it would be just as reasonable to examine the phenomenon by studying the piece of steel only and overlooking the importance of the method of holding the tool, as to examine, as Mr. Beaumont has done, the rail alone, and to overlook the tool which has made the corrugation—that is to say, the truck. It seems to me that the only investigation which really carried us some distance towards a sound theory of corrugation, and therefore its possible cure, was that of Prof. Carus-Wilson, which he explained some years ago before the Tramways and Railway Association, and it is noticeable that in his investigation he went particularly carefully into the changes of action which are known to occur, or which may logically be presumed to occur, between the wheels and the rails when the vehicle is in motion.

I have always maintained that just as one's mechanical sense, unaided by mathematics, would lead one to expect chattering in a lathe when the tool is placed too high, so the same sense would lead one to expect corrugation or something analogous to it when a vehicle with a fixed wheel base is run along a rigid track. In my opinion corrugation will be cured before the exact cause of the disease is clearly understood, and this will be done by stopping the present endeavour to make "an irresistible force meet an immovable body," or, in other words, to expect a rigid truck and a rigid track to work harmoniously together. It really seems that the study of the action between wheels and rails when the wheels form part of the ordinary practical vehicle, and are not under the conditions of a laboratory test, is neglected. In my own attempts to follow the arguments of writers on the subject of corrugations, I received the impression that the tramway truck is not taken seriously, and I feel a mild astonishment when I read that tramway trucks have reached the highest point in their design, and that attention need only be given now to some of the details of their construction. It is true that I have only seen such a statement in an advertisement, but I suppose that must be the opinion of engineers generally; otherwise, the brains behind the advertisement would have avoided making a statement so obviously out of keeping with public opinion, and so difficult to reconcile with the continued existence of corrugations.

I look forward, Sir, to a sound study on the part of an expert of the action between tramway trucks and rails, and it is a simple prophecy to say that until such a study is made we shall be no nearer overcoming the troubles due to corrugation.

J. A. O'Brien.

London, E.C., *September 20th*, 1911.

High-Voltage Testing.

With reference to the article on "High-Voltage Testing," by Mr. D. H. Ogley, in your last week's issue, I attach herewith a few remarks bearing on the subject, which may be of interest to your readers.

The class of high-voltage testing apparatus which is generally installed for the purpose of making accurate tests of the dielectric strength of insulating materials, &c., is much more elaborate, and, consequently, more expensive than that which is required by the manufacturer for testing his machines, &c., in their different stages of manufacture.

What the manufacturer requires is a small testing equipment which is easily portable and capable of giving the requisite voltage for the different standard tests which have to be made when connected to a constant low-voltage supply adjacent to the job.

All that is necessary in this case is to have a double-wound transformer provided with a series of tappings on the H.T. side. The tappings dividing the H.T. winding into equal divisions, may be taken to one switch dial, while another series of tappings, sub-dividing one of the main divisions, may be taken to another switch dial. This arrangement will give sufficient variation of voltage for all practical purposes. The transformer and switch dials complete would be contained in a suitable wooden box, mounted on wheels, and provided with a handle for convenience in moving about. On the outside of the box would be mounted a single-pole overload circuit breaker, and a double-pole switch and fuses. In addition to the above, it is usual practice to fix a red lamp on the box, which will indicate to the tester and those near by, when the transformer is alive.

With regard to the equipment for any technical school laboratory, it is always desirable to raise the voltage very gradually from, say, zero to a maximum value, with as much accuracy as possible. Regulation obtained by variation of generator excitation is good, but at low values is not accurate. Perhaps the best arrangement is the use of an auto-transformer provided with a large number of tapping on one half of the winding, and arranged so that the secondary voltage may be varied from zero to twice the normal supply voltage, in twice as many steps as there are tappings on the auto-transformer. In addition to this, the L.T. winding of the H.T. transformer may be designed for series parallel connection, in which case a greater range will be obtainable on the H.T. side.

With reference to the method of regulating the voltage, shown in the connection diagram printed in the above-mentioned article, it will be noted that this method has the advantage that no preventive resistance is required, whereas in the case where an auto-transformer is used, a steady variation of voltage can only be obtained by using a preventive resistance; but it has a serious disadvantage in addition to the watts lost in the resistance, and that is, that at low voltages the wave shape may be anything, and thus accuracy is out of the question.

R. G. Parrott.

Manchester, *September 23rd*, 1911.

Charging Ignition Cells.

With reference to your correspondent "P.'s" letter in last week's issue of the Review, I should like to state that I do not consider the method of charging small cells from the regulating cells of a lighting battery a good one.

First, because, unless the regulators are always properly charged, and have an extremely large capacity (the capacity depending as much on their condition as their size) in proportion to that required for charging other cells, they are liable to be often run down, or possibly reversed, and their useful life considerably shortened thereby.

Secondly, this method requires constant attention in order to ensure that the ignition cells are getting a steady charge at the proper rate, as this will vary whenever the regulators are cut of circuit, or put on charge, or discharge.

Thirdly, separate regulating resistances have to be rigged up if different size cells are to be charged, the C^2RT loss in these, although small, being absolutely wasted.

Although charging cells through lamps is considered a wasteful method, it has the advantage of ensuring a steady current in the right direction, and if the lamps used are placed in positions where their light can be utilised (the reduction in candle-power being almost imperceptible in the case of the higher voltage lamps), the factor of waste entirely disappears.

E. C. E.

The Electrical Exhibition: An Impression.

The Executive Committee and the exhibitors are to be sincerely congratulated on this fine Exhibition. It will have far-reaching results, not only on the internal, but also on overseas trade, and it is the latter which needs to be cultivated most assiduously.

The various Imperial Conferences in London, especially those at which the journalists foregathered, have, however, opened the eyes of the native born Colonial and foreigner to the fact that we are not so backward as we think we are. This Exhibition will still further help to bring that fact home to purchasers overseas.

I doubt very much if the Germans or the Americans could get together such an exhibition, for the very good reason that two or three large juggernaut trust concerns would practically monopolise the whole show. That sort of thing may be pleasing to the people of countries where trusts can thrive, but it won't suit us. Personally, the more I learn about trusts the more I hate the idea of them. I feel sure

that in the end they will be found to be a distinct bar to progress, and will place any country that submits to them behind the times. It stands to reason that when any firm can monopolise a market the tendency is to manufacture in great quantities certain lines of goods and force them on the market willy nilly.

On the other hand, our specialist firms making a few items really well, are in a position to adopt improvements at short notice and take the fullest advantage of their employés and purchase ideas. I, personally, am delighted with the novelties that are to be seen on the various stands. One feels that after all the electrical John Bull is as much alive as the shipbuilding, textile and banking John Bull. There are plenty of good ideas floating around, and inventors are only too glad to find firms enterprising enough to take them up. Purchasers like to deal with firms which they think are quick to adopt new improvements.

The *bonhomie* of the representatives of the various stands is pleasing, and you do well to emphasise that one of the objects of the Exhibition to bring about a greater intimacy between those directly interested in electrical industry. We have all been at times perhaps just a little too suspicious of the other fellow, and resentful when he booked the order, &c., but that is not British; it is not sportsmanlike. Rubbing shoulders at this Exhibition will do a world of good and make it all the easier for the N.E.M.A. to rope in those firms that have hitherto held aloof. I hope they will succeed in getting them all, for an association together of firms for fostering the industry generally is just as good as the trust movements and cartels are bad.

There was a time, not so long ago, when German, Swiss, Belgian and American electrical apparatus came into this country like a flood because the foreigners quoted lower prices. But they cannot do so now. The hard schooling through which home firms have passed has taught the need of specialisation and standardisation, with the result that even Belgian firms—and they are most favoured so far as freight is concerned—cannot get down to British prices, and what is more, are not able to deliver promptly. It is satisfactory to note that the traditional British reputation for solidity and soundness has not been sacrificed. If anyone is doubtful on that point, he should make a close examination of the exhibits at Olympia. I venture to say that, for fine lines of design, for finish, solidity and novelty, nothing better can be turned out anywhere in the world.

The world is, in fact, beginning to find out that the best value for money in electrical apparatus and machinery is to be obtained in this country; also that improvements are more readily adopted by our specialist firms than by the unwieldy foreign trust organisations. If properly fostered, the trade overseas should now grow at a great rate, and every opportunity should be taken to let people who live in the Colonies and abroad know what British electrical manufacturers can do.

In this connection I would make two suggestions:—First, let the secretary supply all the offices of the Agent-Generals, the agents for the Crown Colonies, the offices of overseas (Colonial) papers which are represented in London with a bundle of tickets for the Exhibition, at the same time asking those in charge of the offices to hand the tickets to any visitors from overseas who may call. For example, at the offices of the *British Australasian* paper, visitors from Australia frequently call to leave their names and addresses, there are also reception rooms at most of the Agents-Generals' offices. A few tickets distributed judiciously at such places and at others one could suggest, would catch the visitors from overseas. Secondly, let the professors and lecturers at the various University Colleges, Polytechnics and technical schools in or near London take their students, not once, but several times, to the Exhibition. Having first noted the interesting points, let them personally conduct the students round to the various stands. This might very well take the place of a lecture and laboratory demonstration and count as an attendance. If, further, the students were given to understand that some examination questions might bear on what they could see at the Exhibition, it would make them all the more keen. I did this with my students at Sydney University during the Railway and Tramway Exhibition, and did it also at the Business Exhibition last year for a quantities and estimates class. A large number of students from overseas are resident in London and many that are British born will in a year or two find their way out there.

Visits to the Exhibition when at an impressionable age have a lasting effect. I remember most vividly certain details which I saw at the Electrical Exhibition at the Crystal Palace.

Both the above suggestions mean that the Executive will have to hand out a good many free tickets, but I think it will pay to do so for the above.

E. Kilburn Scott, M.Inst.E.E.

Free Tickets for Olympia.

In your leading columns this week you complain of the apathy of supply authorities in connection with the purchase of tickets for Olympia. I am inclined to think that it is not so much a case of apathy, but that the authorities concerned discovered at the time of the 1905 Exhibition that it was easy enough to purchase tickets, but it was not so easy to force recipients to make use of them. The supply company with whom I was then connected purchased a large number of tickets and distributed them with some care. I took the trouble afterwards to discover what use had been made of the tickets, and I was considerably surprised and disappointed to find what a small proportion had been utilised.

Probably others had similar experiences, and hence the present reluctance to purchase tickets wholesale. Of course, if one is to look upon the purchase of tickets as a form of subscription to the funds of the Exhibition, there is, no doubt, much to be said in favour of such a course, but my present purpose is merely to reply to the particular aspect of the case brought forward in your leaderette.

Supply Engineer.

September 23rd, 1911.

[See our "Notes" pages to-day.—Eds. E.R.]

Trade Discounts to Private Customers.

We know that you have done your best to induce the trade to keep up prices legitimately, so that we think you will not object to publish the attached correspondence, as we think that a dose of the pillory may do Mr. —— good.

Wm. Coates & Sons, Ltd.

Dublin, *September 25th*, 1911.

COPY.

September 14th, 1911.

Messrs. X. & Co.

Dear Sirs,—Mr.——, Dublin, informed us that he purchased certain fittings from you, and as we are his contractors we shall be obliged if you will render the account through us.—Yours truly,

Wm. Coates & Sons, Ltd.

September 15th, 1911.

Messrs. W. Coates & Sons, Dublin,

Dear Sirs,—I have your letter of the 14th, and note you wish me to render the account through you, but I cannot see my way to do this, as the order was given to me by Mr. ——, and not by yourselves.

When sending the inquiry he asked *re* my best discounts, and I allowed him such discount as to reserve a 10 per cent. commission for his electrician. This I am quite willing to allow you.

Would my electric fittings catalogue be of any service to you? If so, I shall be pleased to send same on hearing from you.—Yours faithfully,

X. & Co.

September 18th, 1911.

Messrs. X. & Co.

Dear Sirs,—We are in receipt of yours of the 5th inst., and regret that we do not at all understand your attitude in this case.

Surely you are not in the habit of selling direct to customers outside the trade, and, of course, the rule is that if a private customer chooses to select fittings for himself, the manufacturer inquires who is the contractor and sends the account in to him with the trade discount taken off. In this particular case, Mr. — has ordered fittings from four different manufacturers, and you are the only one who has not complied with the general rule, and we do not see our way to accept the absurdly small commission which you offer, without taking the matter further.—Yours truly,

Wm. Coates & Sons, Ltd.

September 19*th*, 1911.

Messrs. W. Coates & Sons, Dublin.

Dear Sirs,—I have yours of the 18th, and note your remarks. It does not matter to me in the least what *you* consider to be right in this matter. I shall proceed to supply the fittings at the price I quoted Mr. —, and whether you accept the 10 per cent. commission or not is absolutely of no moment to me.

I am not in the habit of being dictated to by any electrician, and do not intend to start now.—Yours truly,

X. & Co.

[While we have pleasure in inserting these letters to show what takes place sometimes in the electrical trade, as the correspondence was of a private nature we do not feel justified in giving the name of the manufacturer.—EDS. E.R.]

Trade Discounts to Consulting Engineers.

I should like to know whether there is any generally accepted view as to the price which should be quoted consulting engineers who are acting for private users. My own practice is to invariably cover the trade, but I believe that some of my trade competitors quote trade prices. In a recent case I told a consulting engineer that I had not quoted a trade price, and he contended that it was not right that he should not get as good a price as, perhaps, a local ironmonger with an electrical department; and he put forward the view that the customer should not pay any more because he was buying his plant through a consultant than if he bought it through a contractor, and that his (the consultant's) fee should take the place of the contractor's profit.

I, however, look upon the consultant as the purchaser, and think that if the purchaser goes to a consultant it means his getting disinterested expert advice instead of having to trust to getting the best value for his money through a man whose idea is to make a profit, and that he ought to be prepared to pay for the advantage he thus obtains. Of course, I do not suggest that the trade should be covered in the case of large contracts with railway companies or similar people.

Manufacturer.

September 19*th*, 1911.

INTERNATIONAL ELECTROTECHNICAL COMMISSION.

THE world's tribunal of electricians, as it may now be called, completed its meetings at Turin on September 13th last. They consisted of two plenary meetings with a two days' unofficial meeting in between. A council meeting was also held, at which the request of the International Congress of the Applications of Electricity, to which we referred last week, was considered. The meetings were held in the Prefecture, kindly lent for the occasion by the local authorities. The first meeting was presided over by Prof. Elihu Thomson, who had journeyed all the way from Lynn, Mass., for the express purpose of attending these meetings. His Excellency the Minister of Posts and Telegraphs, Signor T. Calissano, welcomed the Commission in the name of the Italian Government. Prof. Elihu Thomson, in a most interesting address, complimented the Italian nation on the influence its great men such as Thomas d'Aquinas, Dante, Galileo and others, had exercised upon the history of the civilised world. He also mentioned our special indebtedness to Galvani, Volta, Ferraris and Pacinotti, whose labours had made this very meeting of electricians possible. Coming to the present day, he mentioned Marconi, who, with such remarkable ingenuity and skill, had put to practical use the discoveries previously made by savants in their laboratories, and had thus given to the world a new and powerful civilising agent, by means of which human thought could be transmitted through the ether. To the Italians, so young in their unity, but so mature in their thought, he offered, on behalf of the Commission, the most sincere congratulations upon their splendid achievements.

He drew attention to the kindness of the Germans who had waived their claim to the holding of the meeting at Berlin, and thus enabled the present reunion to be held concurrently with the Electrical Congress during a great Exhibition commemorating the first 50 years of Italian autonomy.

He also recalled the St. Louis Electrical Congress of 1904, at which he had had the honour to preside, when Colonel Crompton presented the paper which had really been the initial starting point of this international enterprise, fast growing into a body of paramount importance and influence. Having passed in review the various problems before the Commission, Prof. Thomson threw out the suggestion that the work be sub-divided by the appointment of a few small committees; he felt that matters of preparatory detail could be dealt with so much more efficiently by small committees than by the I.E.C. as a whole. He closed his speech by saying how much he appreciated the honour conferred upon him in 1908 when he was elected President of the Commission.

Colonel Crompton, as honorary secretary, made a report on general progress, in which he stated that there were now 21 countries taking official part in the movement. He mentioned the indebtedness of the I.E.C. to the British Indian Government for continuing its generous support, which was deeply appreciated. He also reported the appointment by the Engineering Standards Committee of a committee to undertake all matters electrical from the international point of view. This splendid piece of co-operation, which could not but materially assist the work of the British Section, had been obtained through the good offices of Mr. Alexander Siemens, President of the British Electrotechnical Committee, to whom they were much indebted. The officers of the I.E.C. were then appointed; Prof. Dr. E. Budde being proposed by M. R. V. Picou (France), was elected by acclamation as the new President; and Colonel Crompton, the father of the movement, as his proposer, Prof. Feldmann (Holland), called him, was re-elected honorary secretary, again by members rising in their seats. Prof. Luigi Lombardi was elected to preside over the unofficial meetings which were to start on the next morning. A loyal telegram was dispatched to the King of Italy, after which the meeting adjourned.

The following is a list of those present at the Turin meetings :—

Belgium.—M. Armand Halleux; M. G. A. L'Hoest; M. E. Gevaert; M. O. De Bast (Secretary).
Canada.—Prof. L. W. Gill.
Denmark.—M. S. A. Faber; Prof. Absolon Larsen (Secretary).
France.—M. R. V. Picou (President); MM. H. Armagnat; P. Boucherot; E. Brunswick; J. Blondin; Ch. David (Secretary); F. Laporte (Secretary adj.); R. Legouez; G. Roux.
Great Britain.—Mr. Alexander Siemens, Major W. A. J. O'Meara, C.M.G., and Dr. Silvanus Thompson, Delegates of British Government; Mr. W. Duddell; Mr. R. Kaye-Gray; Prof. T. Mather; Mr. P. F. Rowell (Secretary).
Germany.—Prof. Dr. E. Budde (Now President I.E.C.); Geh. Ober. Post. Prof. Dr. K. Strecker; M. Georg Dettmar (Secretary).
Holland.—Prof. Clarence Feldmann (President); M. L. M. Barnet Lyon.
Hungary.—Prof. Dr. Moritz de Hoor-Tempes; Mr. Antony Steller.
Italy.—Prof. Luigi Lombardi (President); MM. C. Clerici; E. Jona; P. Verole; Prof. G. Grassi; MM. E. Morelli; G. Duran; Guido Semenza (Secretary).
Japan.—Mr. A. Oya.
Mexico.—Senor Alfonso Castello.
Russia.—Prof. M. de Chatelain.
Spain.—Senor Don Luis de la Pena.
Sweden.—Mr. C. A. Rossander (President); Mr. E. C. Ericson (Secretary).
Switzerland.—Mr. K. Taüber; Prof. Jean Landry (Secretary).
U.S.A.—Mr. C. O. Mailloux (President and Government Delegate); Mr. Gano Dunn (President, A.I.E.E. and Government Delegate); Dr. Clayton S. Sharp; Prof. Elihu Thomson (Retiring President of I.E.C.); Dr. A. E. Kennelly (Secretary).
British Indian Government.—Mr. J. W. Meares.
Ecuador.—Mr. Richard Muller.
Panama.—Mr. G. A. Bona.
The Portuguese Consul.
Mr. Leon Gaster (Illuminating Engineering Society of London).

Col. R. E. Crompton, C.B., *Honorary Secretary.*
C. le Maistre, A.M.Inst.C.E. *General Secretary.*
E. L. Litton, *Assistant.*

The unofficial meetings presided over by Prof. Lombardi discussed in detail the work which has been before the National Committees for the past 12 months, and had as a basis for their discussions the *résumé* of the unofficial meeting held in Brussels last year. The main headings were Nomenclature, Symbols (including the symbols for Ohm's laws and vector rotation in A.C. diagrams) and the rating of electrical

machinery. The discussions were of the most amicable nature, and fully bore out the fact that the delegates were no longer strangers but veritable comrades, with one aim and object—the progress of the industry.

The following is the substance of the decisions on the main points referred to above, which were formally adopted at the second plenary meeting held on Monday, September 11th.

Nomenclature.—The list of terms and definitions, as proposed at Cologne in May last, and submitted to the National Committees and amended at Turin previously to the meetings of the I.E.C., is provisionally adopted in French and English, the official languages. The term "provisionally" is introduced to imply that if at the next meeting in 1913 it is found absolutely necessary, modifications to the definitions will be considered with a view to adoption.

The list is to be published in two ways, one alphabetical, the other in order of sequence of ideas as suggested by the Danish Committee. The small Committee, consisting of one member each from Great Britain, France and Germany, is to remain in being for two years. Prof. Larsen (Denmark) is specially invited to attend. A Spanish representative is also requested in view of the importance of the Spanish language. Only the three principal countries vote.

Symbols (provisionally adopted by the I.E.C.).—

1. Instantaneous values of electrical quantities which vary with the time are to be represented by small letters.

2. Virtual or constant values of electrical quantities to be represented by capital letters.

3. Maximum values of periodic electrical quantities to be represented by capital letters, followed by the subscript "m."

4. Magnetic quantities, constant or variable, to be represented either by capital script, Gothic, heavy-faced or any special type.

5. Maximum values of magnetic quantities to be represented either by capital script, Gothic, heavy-faced or any special type followed by the subscript "m."

6. The following quantities to be represented by the following letters:—

Electromotive force	E, *e*	
Electric quantity	Q, *q*	
Inductance*	L	For type, see pars. 4 and 5.
Magnetic force	H	
Magnetic flux density	B	
Length	L, *l*.	
Mass	M, *m*.	
Time	T, *t*.	

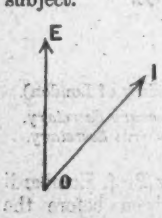
* Coefficient of self-induction.

The letters I, E, R were definitely adopted to represent the current, electromotive force and resistance in the simple expression of Ohm's law.

The term "Reactive power" was adopted to designate, in A.C. questions, the quantity U I sin ϕ.

A committee consisting of one member each from Belgium, France, Germany, Great Britain, Holland, Italy, Spain, Switzerland and the United States of America, was appointed to continue the study of international symbols.

Through the intermediary of the German Local Committee, it is confidently hoped that the I.E.C. will obtain the full benefit of the co-operation of the A.E.F., the Committee on Symbols, appointed by the Elektrotechnischer Verein, of which Prof. Dr. Strecker, a member of the German Committee, is President, and which has done such useful work during the past 10 years with regard to this particular subject.



Diagrams for A.C. Quantities.—In the graphical representation of alternating electric and magnetic quantities, advance in phase shall be represented in the counter-clockwise direction.

NOTE.—In consequence, the impedance of a reactive coil of resistance R and inductance L is $R + \sqrt{-1}\, L\, \omega$, and that of a condenser of capacity C is $\frac{1}{\sqrt{-1}\, C\, \omega}$ where $\omega = 2\pi \times$ frequency. It follows also that the diagram represents the phase relations in a simple A.C. circuit containing an impressed E.M.F. O E, and a lagging current O I.

Rating of Electrical Machinery.—1. The output of electrical generators is defined as the electrical power available at the terminals.

2. The output of electrical motors is defined as the mechanical power available at the shaft.

3. Both the electrical and mechanical powers to be expressed in international watts.

A committee consisting of one member each from Belgium, France, Germany, Great Britain, Italy, Sweden, Switzerland and United States of America is to continue the study of the rating of electrical machinery and apparatus. All the local committees are invited to put themselves in communication with the societies in their respective countries which have carried out work of this nature, in order to avail themselves of what has already been accomplished, and obtain the necessary co-operation so as to avoid overlapping of interests.

General.—All local committees are to be at liberty to send delegates to attend the meetings of any or all special committees, and they will receive notice of such meetings from the central office. The voting, however, is confined to the actual members of the particular committee.

Future Meetings.—The next official meeting will be held at Berlin in 1915, the exact date to be fixed later.

The I.E.C. accepted the invitation of the American Institute of Electrical Engineers, presented by Mr. Gano Dunn, its President, to hold an official meeting at San Francisco in 1915, and instructed the Central Office, on the request of the American Institute, to co-operate with it in the organisation of an International Electrical Congress at San Francisco at the same time.

At the meeting of the Council of the I.E.C., an official request of the Turin International Congress of the Applications of Electricity, with reference to future electrotechnical congresses, was received, and, after expressing its thanks to the Congress, the Council decided that, subject to the ratification of the National Committees, it would be prepared to undertake the task of organising future electrotechnical congresses.

It also accepted the invitation transmitted through the American Local Committee, with reference to holding an International Electrotechnical Congress at San Francisco in 1915.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

"Aston" Electric Radiators.

In the new pamphlet which has been issued by MESSRS. VERITYS for the coming season, showing their "Aston" electric radiators, they illustrate a variety of designs, including a specially cheap line for hiring out by supply companies. This we show as supplied in a form convenient for stocking and packing—being made to nest and so to economise space—in fig. 1. It is made for either two or four lamps, and has a wrought-iron base and real copper reflector. In addition to a variety of registered designs of luminous types,

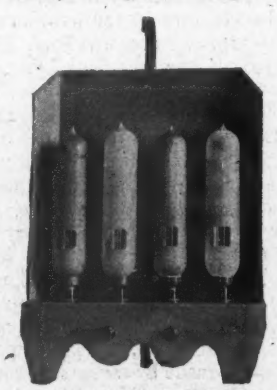


FIG. 1.—"ASTON" RADIATOR.

among them some in the Stuart, Chippendale and Tudor periods in antique brass or silver, gilt colour, &c., a number of other types, non-luminous, for bath rooms, workshops, &c., are included. There are further some finely-finished examples of non-luminous radiators in rich ornamental cases of solid brass and other metals, made in Georgian, Adams, Elizabethan, Chippendale and other styles. Lamps and some other accessories for use in these radiators are also

listed. Messrs. Veritys have now completed the extensions to their London sales depôt at 31, King Street, Covent Garden, W.C., where they invite an inspection of their engineering display, cooking and heating showrooms, and periodised fixture galleries.

Water Softening and Mud Extracting.

MESSRS. ROBERT BOBY, LTD., of 212, Upper Thames Street, E.C., have introduced the "Neckar" apparatus for softening water for boilers and automatically extracting mud from them. In this device, of which a section is given fig. 2, the untreated water (preferably heated by exhaust steam) is admitted through a ball valve to a dip pipe in a tank as shown, while the required amount of soda solution is simultaneously admitted by a second valve; a corresponding amount of hot water from behind the blow-off cock of the boiler is allowed to flow in by a third valve at the same time, and mixes with the water and soda at the outlet of the dip pipe, without commotion. The impurities precipitated by the

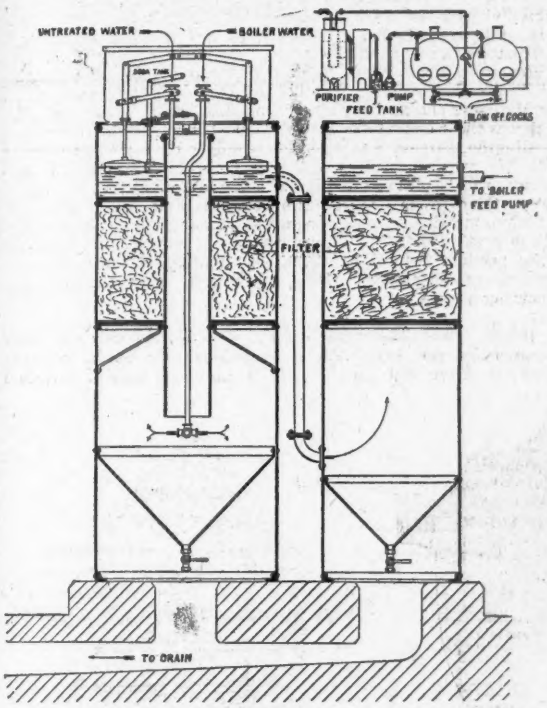


FIG. 2.—SECTION OF "NECKAR" WATER SOFTENER.

reagent and the rise of temperature settle quietly in the conical base of the drum, while the treated water rises through a filter and flows into a second drum, whence, after passing through a second filter, it is drawn off by the boiler-feed pump. The continual flow of water from the bottom of the boiler, though very small in amount, is stated to be effectual in removing mud and sludge, and thus preventing the formation of scale without waste of hot water, and the amount of reagent required to soften the water is reduced to a very small proportion of that required to treat cold water. The apparatus has been adopted with satisfactory results in many boiler installations, having been in use on the Continent for several years.

Two-Point Control.

MESSRS. A. P. LUNDBERG & SONS, of Pioneer Electrical Works, 477, Liverpool Road, N., write us with regard to the inconvenience resulting from the control of bedroom and staircase lamps from one point only, for the sake of economy in first cost. One of the most valuable features of electric lighting is the ease of control, and in all such cases the advantages derived from the installation

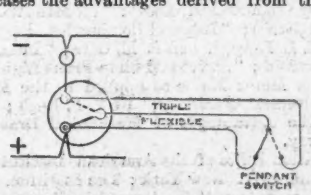


FIG. 3.—DIAGRAM OF CONNECTIONS.

of the double control far outweigh the slight additional cost, going far, indeed, to gratify the user and make him an eloquent advocate of electricity for lighting. Messrs. Lundberg point out that the deficiency above-mentioned can easily be remedied without interfering with the existing wiring at all, as shown in the adjoining diagram; the conversion only involves the substitution of a two-way surface switch for the single-way one, and the addition of a similar switch, or a two-way pear switch for bedroom use, which is connected with the former by a triple flexible carried on porcelain buttons or through insulated screw eyes. Contrary to the usual custom, the "common" terminals of the two two-way switches are interconnected in this case. If it is desired to restore the original connection on giving up the house, the two-way switch can be made to act as a single-way one by short-circuiting two of the terminals, the flexible and extension switch being removed. This simple and ingenious device is worth knowing, as there are very many cases in which it is applicable.

Volt-Hour Meters.

A new "volt-hour" meter, which, it is believed, will commend itself for use in various directions, but particularly in connection with tramway undertakings, has been suggested recently by Messrs. R. G. Cunliffe and J. G. Cunliffe, of the Manchester Corporation tramways, and developed by the BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD., of Trafford Park.

This meter, which is illustrated in fig. 4, is referred to in a paper on "Tramcar Meters," read by the Messrs. Cunliffe this week before the Municipal Tramways Association in Glasgow.

The new meter is in principle a direct-current motor in its simplest form, having a moving armature of a special and simple design. The meter is designed so that the speed of the armature is proportional to the voltage, and is arranged to read in volt-hours; thus at the end of one hour, the average voltage of the circuit during that hour is indicated directly on the dial.

The importance to tramway managers and engineers of keeping a constant check on the average voltage at various points on their systems, both during normal working and under special service conditions, is obvious.

When the voltage becomes unduly low, through long feeders, long trolley lines, or heavy loading, serious losses are incurred, as well as reduced speed, and to keep to schedule time a driver may be compelled to use energy in driving where otherwise with higher

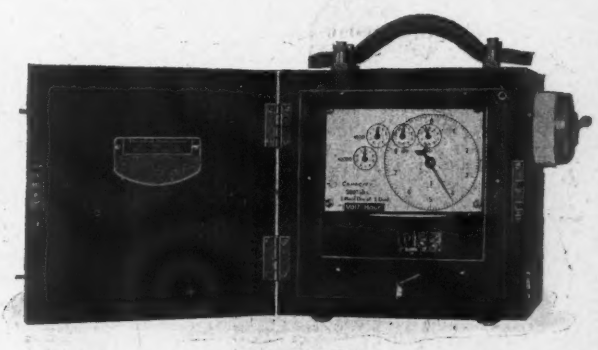


FIG. 4.—VOLT-HOUR METER.

voltage he would be able to coast. Another direction where a knowledge of the average voltage on a circuit is desirable, is in connection with systems using ampere-hour meters on cars. Conclusions drawn from readings taken in ampere-hours only may be misleading, and therefore the average voltage during the period of registration should be known, and the readings in ampere-hours corrected to represent the actual energy expended.

Up to the present time, instruments recording with a pen upon a paper chart have been used in efforts to determine average voltages. Under all conditions, however, the value of the results so obtained is impaired by the error resulting from friction between the pen and the paper, and when meters of this type are used on tramcars, a further error is introduced by the effect of frequent stopping and starting and vibration and jolting upon the pen.

The new meter has neither pen nor paper, and therefore is free from the drawbacks indicated. It can be used in a stationary position or upon a car. It has the advantage of recording directly upon a dial, and being exceeding simple in construction, it can be had at a comparatively low cost.

The Luxometer.

A compact and practical little photometer, made by MESSRS. EVERETT, EDGCUMBE & CO., LTD., of Collindale Works, has been brought out under this title, for the measurement of illumination, both interior and exterior. Fig. 5 shows the complete outfit, including the Luxometer (C), battery (S), and daylight attachment (B); the weight is only 1½ lb. Fig. 6 shows how it is used.

The scale is about 6 in. long, and in standard instruments is graduated up to 10 or 20 ft.-candles, as preferred, with two ranges. It is specially opened out at the lower part, so that great accuracy is possible even when measuring feeble illuminations, and is direct reading.

When in use the instrument is held in the hand, no stand or other support being required. For transport both the photometer and the battery can be carried in the pocket, or they can be supplied fitted in a small leather case with shoulder strap, if preferred. Illumination measurements can be made at any angle, and candle-power measurements can be readily made, irrespective of the colour of the light. The surface brightness or intrinsic brilliancy

of any surface can be instantly measured by viewing it through the instrument.

A simple attachment can be provided whereby what is spoken of as the "window efficiency" of a room can be determined. Merely to state that the illumination observed in a certain room lit by daylight was so many foot-candles is quite meaningless, depending, as it does, entirely upon the state of the sky. By means of this attachment (B in fig. 5), on the other hand, a definite figure can be

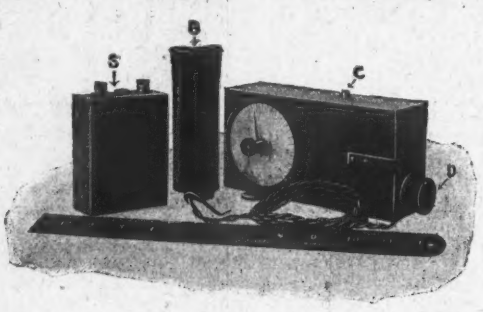


Fig. 5.—The Luxometer.

obtained for this illumination quite independently of the brightness of the day.

The principle upon which this photometer is based is a modification of the well-known Trotter method, in which the illumination derived from an electric lamp, contained in the case, is adjusted until it is equal to that to be measured. A pointer moving over a direct reading scale indicates this illumination without any calculation whatever.

Fig. 6.—Mode of Using the Luxometer.

The cell supplied with the Luxometer is of a special "non-spillable" type, contained in a celluloid or ebonite case, so that it can be used in any position or carried in the pocket without fear of spilling. It only requires charging at rare intervals, and this can be done at any motor garage.

The development of the method is mainly due to Mr. P. J. Waldram.

"Efesca" Outdoor Lighting.

Fixtures of the "Efesca" patterns for outdoor lighting form the subject of Messrs. Falk, Stadelmann & Co.'s new catalogue, No. 319. The fixtures have all been specially designed for use in conjunction with "Efesca" and other metal-filament lamps, and in addition to being of interest to those who have to do with the lighting of streets, railway stations, docks, &c., there are lines which should appeal to electrical contractors who purchase designs suitable for shop front lighting, doorways and interiors. In order to indicate the class of contents in the catalogue we illustrate two examples, fig. 7 being the "Eton" lantern, which is supplied for four or five 50-c.p. lights, and is a cast-iron, hinged watertight fitting, with vitreous white enamelled conic reflector and clear flint globe. Fig. 8 represents the "Arundel" outdoor lighting fitting. It has a vitreous enamelled iron casing, black outside and white inside, and takes one lamp up to 600 c.p. It has either a plain clear flint globe or a clear flint optic moulded globe. Other lines for use in outdoor installation work are included in the list, among them being watertight switches and fuses, lamp brackets and columns, &c.

Fig. 7.—The "Eton" Lantern.

Fig. 8.—The "Arundel" Fitting.

Wireless Telephony.—According to the daily Press, Mr. A. W. Sharman has recently carried out a number of successful experiments with his system of wireless telephony, with which conversation can be carried on through more than a mile of water.

BUSINESS NOTES.

Showcard Competition.—We are informed that the Siemens Tantalum Showcard Competition has proved an unqualified success. Approximately 2,000 designs were submitted by competitors, and we learn that each of these designs has had careful consideration by the staff responsible for the selection of the winning designs, and we are now able to announce the names of the successful competitors. It will be remembered that a first prize of £75 was offered, with a second prize of £25, together with a prize of £5 for any designs of more than average merit which the firm decided to adopt and reproduce. Owing to the large number of designs received, the task naturally proved somewhat difficult, and eventually it was decided by mutual arrangement with the two artists that the two best designs should be bracketed as being of equal merit, and the £100 prize divided between the two successful competitors. Therefore a prize of £50 goes to Mr. L. Sutton Wood, 3, Featherstone Buildings, Holborn, W.C., and a similar prize of £50 to Mr. Frank M. Barton, 2, Montague Road, West Ealing, W., who are to be congratulated upon their success. Further accepted designs were submitted by Mr. Reginald E. Higgins, 8, Grenville Place, Maida Vale, W., who was the recipient of a £5 prize, and Mr. F. Insall, Water Lane, Brislington, Bristol, was also the recipient of a similar prize of £5. We are informed that the designs of non-successful competitors will be duly returned. The number of attempts made to obtain these prizes demonstrates that the distinctive features of tantalum metal-filament lamps are well known, and for the comfort of the host of disappointed competitors it may be said that it is quite possible that if a further opportunity occurs a different method of displaying these advantages may ensure their obtaining a prize.

Book Notices.—*Electrical Power Generation and Transmission for Main Marine Propulsion.* By W. P. Durtnall. London: From the Author. Price 1s.—This booklet has been written by Mr. Durtnall, a pioneer in this branch of engineering, to explain the advantages of electricity for the purpose of propelling vessels, and the means by which he proposes to apply it. The various known systems are described, including, of course, the "Paragon" system of transmission, which the author has developed, and of which he gives particulars. This system is based upon the use of three-phase motors, and the necessary variation in speed of the propeller is effected by an ingenious method of varying the frequency of supply, while the generator is kept running at full speed.

Proceedings of the Incorporated Municipal Electrical Association. London: Wyman & Sons. Price 5s.—The issue for 1911 contains the following papers:—Presidential Address, by J. Christie; "Electricity Supply viewed from the Municipal Committee's Standpoint," by Councillor H. Leese; "Modern Wiring Practice," by J. W. Beauchamp; "Internal-Combustion Engines in Power Stations," by H. L. Howard and R. M. Carr; "Purchase of Fuel," by C. E. C. Shawfield; "Street and Shop-Front Lighting," by A. H. Seabrook; "The Motor Meter as applied to the Measurement of Single-Phase Alternating Current," by V. F. Bush; "Steam-Power Generation: The Advantages of Mechanical Draught," by J. R. Campbell Murray.

"Standardisation Rules of the American Institute of Electrical Engineers." June, 1911. New York: The Institute. Price 10 cents.

"The Electrical Nature of Matter and Radioactivity." By H. C. Jones. 1911. London: Constable & Co. Price 8s. net.

"White's Engineering Pocket-Book." 1911. Wigan: T. Wall and Sons. Price 1s.

Prospectus of the Royal College of Art, London. 1911-12. London: Eyre & Spottiswoode, Ltd. Price 3d.

"Atti della Associazione Elettrotecnica Italiana." August, 1911. Milan: Stucchi, Cenetti & Co.

The Pavement Artist.—The Imperial Lamp Works (Brimsdown), Ltd., are to be congratulated upon their unique method of attracting the attention of visitors to the Exhibition.

On the opening day at about 3.30 p.m., shortly after the official ceremony, a solitary ill-clad figure of an elderly man was seen limping towards the main entrance, where he set himself down, and commenced very diligently to cleanse the flagstones. His next procedure was to start upon a drawing of an electric lamp having for a background a large Union Jack. Before giving any inkling of what this picture was intended to represent, he transferred his attention to another paving stone, and portrayed a silhouette of the City of London. The same electric lamp was then drawn in on the sky. By this time a considerable number of people had gathered, and no doubt wondered what the affair was all about. The pavement man, however, was too much of an artist to reveal

THE PAVEMENT ARTIST.

his secret immediately, and kept his spectators in suspense while he drew a picture of an old-fashioned candle, which drawing he termed "Past." By the side of this he again designed a metal-filament lamp. Then the secret was revealed. He wrote "Support home industries—use Brimsdown," on the first design, on the second he placed the slogan, "After sundown—Brimsdown," and then sketched in colours the words, "See things in a better light—use Brimsdowns now—to-morrow—and all the time." He then displayed two Brimsdown show-cards with a large Brimsdown poster in the background. The enterprising artist then reaped the reward of his labours, and coppers were thrown to him by patronising electrical contractors, who, of course, by this time were able to recognise the advertisement behind the scheme. In return for the pennies they were presented with a pack of Brimsdown playing cards, a packet of Turkish or Virginian cigarettes, a Brimsdown purse calendar, or a unique advertising novelty showing the remedy "If your light is bad." This certainly formed an ingenious way of advertising the lamp. We have since learned that the decrepit old gentleman was no other than Mr. J. Conway Price, of 151, Fleet Street, E.C., with some of whose advertising work our readers are quite conversant. It is said to be Mr. Price's intention to have the 91 coppers presented to him, mounted and framed, to be kept as a souvenir.

Trade Announcements.

—MESSRS. CHAPPLE, DALBY AND CO. have just started business as electrical and general contractors at 27, Phayre Street (Railway Block), Rangoon, India, and they desire catalogues and trade discounts from electrical, mechanical and gas engineering and supply houses in England.

THE UNITED RIVER PLATE TELEPHONE CO., LTD., has changed its address to 5, London Wall Buildings, Finsbury Circus, E.C.

MESSRS. S. BILL & CO. announce that owing to the large demand for their ironclad switches and fuses, they have removed into much larger ground floor premises at 387, Park Road, Hockley, Birmingham.

Owing to lease termination, MESSRS. PARKER & HEAGERTY, metal merchants and agents, have removed to 6 and 8, Lime Street Square, E.C. The firm are acting agents for Messrs. Sperryn and Co., Ltd., the Delta Metal Co., Ltd., Messrs. Hepburn, Gale & Ross, Ltd., Nederlandsche Fabriek van Werktingen en Spoorweg-Materieel.

MESSRS. MARRYAT & PLACE notify that their telegraphic address has been changed to "Marryat, London."

THE UNION ENGINEERING CO., electrical engineers, of Wood Street, Livesey Fold, Darwen, announce that they are retiring from business.

On September 29th (to-day) MR. J. R. DENNANT is removing to larger premises at 106, Balls Pond Road, N. He asks for catalogues and lists from electrical manufacturers.

MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., have opened a new branch at 88, Albion Street, Leeds, with Mr. G. E. Mason, who has been representing them in the district, as manager of the branch. Stocks of cables, wires, flexible cords, jointing materials, joint boxes, are being held there. Telegraphic address, "Henletel, Leeds"; telephone number, "Central 3,006."

CHECKOGRAM (1908), LTD., of 150, Oxford Street, W., are extending their business to embrace all branches of electrical installation work, especially telephones. Catalogues and lists are invited from suppliers and manufacturers.

Dissolutions and Liquidations.

—J. G. CHILDS & CO. LTD., electrical engineers, Hawthorn Works, Willesden Green.—The following are the principal creditors, viz.:—

UNSECURED.

	£		£
Adams, F. E., Tool Co., Ltd.	223	Glover, W. T., & Co.	135
Allen, Edgar & Co., Ltd.	16	Green, Arthur	40
Anderson's Bristol Rubber Co.	19	General Electric Co.	108
Ash & Lacy, Ltd.	22	Harboro & Poole	28
Aston, D.	28	Highton & Son, Ltd.	41
Baldwin's, Ltd.	36	Hill, T. S.	12,596
Balmforth, T., & Co., Ltd.	84	Hymans, Alfred	54
Bedford Motors	45	Jackson, W. and T.	31
Berry, Skinner & Co.	42	Livermore & Hourder Bros. and Co.	66
Black and White Publishing Co.	22	London Electric Wire Co.	10
Booth & Brookes	24	London and South-Western Bank	28
British Press, Ltd.	47	Lysaght, John, Ltd.	23
British Mica Co., Ltd.	80	Martin, Paul, & Co.	18
British Manufacturers' Publishing Co., Ltd.	15	Morton & Burt	60
Brookes & Walker	17	Myerson, F. T.	94
Brown, John, & Co., Ltd.	38	Newnes, Geo., Ltd,	158
Brown, W. B., & Co., Ltd.	109	Nilson Bros.	28
Buck & Hickman, Ltd.	51	Northgate Ironworks Co.	52
Buckley, Samuel	37	O'Brien, Thomas, & Co.	15
Builder, The	26	Osby, T.	61
Butler & Jordan	32	Palmer, A. C., & Co.	49
Carr, Jas. W., & Co.	17	Perkins & Co., Ltd.	74
Canada Newspaper	24	Pfeil & Co.	67
Cargo Fleet Iron Co.	24	Phosphor Bronze Co.	84
Consuls, H.M., List	21	Potter, F. W., & Co.	227
Cory Bros. & Co., Ltd.	16	Pritchetts & Gold	88
Credenda Conduits Co., Ltd.	29	Phipps, R., Executors of	3,708
Davis & Timmins, Ltd.	49	Quinney, W. M. & A.	46
D.P. Battery Co.	78	Rayner, T. J., & Sons	23
Dudley's, Earl, Round Oak Works, Ltd.	102	Rhodes Motors, Ltd.	40
Durant, H.	18	Rollett, H., & Co.	85
Edwards, C. J., & Co.	18	Thompson, W. P., & Co.	123
El Commercianti	51	Tortoise Foundry Co.	26
Electric Construction Co., Ltd.	278	Westwood, J., & Co., Ltd.	48
Engineer, Ltd.	16	*Whitehall Review*	27
Fitzgerald, Ltd.	19	Willesden District Council	52
Foster Engineering Co., Ltd.,	46	Wood, Stannard & Hendre	89
Gane, Jackson & Co.	42		

RENO ELECTRIC STAIRWAYS AND CONVEYORS, LTD.—This company is winding up voluntarily with Mr. M. Lancaster as liquidator. The liquidator has been authorised to sell the undertaking, &c., to Reno, Ltd., receiving as consideration fully paid shares in the latter company. A meeting of creditors is called for October 9th at 1, Basinghall Street, E.C.

HOWE ELECTRICAL ENGINEERING CO., LTD.—Creditors must send particulars of debts, &c., to Mr. A. Thraves, 7, Victoria Street, Liverpool, the liquidator, by October 11th.

GATLEY & CO., electrical engineers and contractors, Water Street, Todmorden.—Messrs. W. H. Gatley and J. Morehouse have dissolved partnership. Mr. Gatley will attend to debts.

JAMES GREAVES & SONS, engine packing manufacturers, East View, Lightcliffe.—Messrs. A. Greaves and F. Greaves have dissolved partnership.

Westinghouse Contracts.

—The following is a list of important orders recently received by the BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD.:—

R. Jeffry.—Two 140-KVA. alternators, transformer switchgear, motors and compressors, &c.
Montague Higginson & Co.—One 150-KW. alternator, exciter and rheostat.
L.C.C.—One hundred sets of controllers, &c.
Hetton Coal Co.—One 250-H.P. motor controller.
Noyes Bros. (Melbourne), for Adelaide Tramways.—Forty T.I.F. controllers.
Metropolitan District Railway.—One 1,200-KW. rotary converter, transformers and switchgear.
British Insulated and Helsby Cables, Ltd.—One 200-KW. rotary converter, transformer and switchgear.
Port of London Authority.—Three 800-KW. rotary converters.
Underground Electric Railway.—One 1,500-KW. rotary converter, and three 550-KVA. transformers.
National Telewriter Co.—Fifty 1,406 G. double-gear machines.
Consolidated Goldfields of South Africa.—One 275-KVA. steam engine set.
Consolidated Goldfields of South Africa.—One 940-KVA. steam engine set.
Oceana Construction Co.—Two 200-KW. D.C. generators with equipment and switchgear.
Craigs, Ltd.—One 85-KW. A.C. generator and exciter, six 20-H.P. and various motors.
Noyes Bros., Sydney.—Two 60-KW. compound wound D.C. generator.
Rintoul & Davis.—One 118-KW. motor-generator set.
Cambrian Combine.—One 35-KW. motor-generator set.
Workington I. & S. Co., Ltd.—One 80-KW. D.C. generator, haulage gear pumps and control gear.
L.C.C.—Ten magnetic brakes.
Randfontein G.M. Co.—One electric main hoist.
Para Construction Co.—Lighting accessories.
Ingersoll Rand Co.—Two 540-H.P. D.C. motors, field rheostats, &c.
A. Ransome & Co., for Grangemouth Docks.—One 2-H.P., two 10-H.P., one 30-H.P., two 50-H.P., 220-volt G. motors, starters and switchboards.
Greenwich Inlaid Lin. Co.—One 100-H.P., one 50-H.P., and one 25-H.P. A.C. motors and control gear.
Sir W. G. Armstrong, Whitworth & Co., for Murray Docks.—Six 20-H.P., 2,315 G., six 4-H.P., 1,609 G., 460-volt G. motors, starters and switchboards.
M. Samuel & Co.—One 165, one 64, one 25-H.P. A.C. motors and pumps.
Central Argentine Railway.—Eight motors aggregating 70 H.P., 500-volt FFB.
Staveley C. and I. Co.—Sixteen 10-H.P. motors, and one 4,000-K.V.A. transformer.
Babcock & Wilcox, Ltd.—Sixteen motors aggregating 30 H.P., 220-volt G. motors, control gear and spares.
Leys Malleable Cast. Co.—Six 12-H.P., 550 FFB. motors and panels (one back geared).
Agar, Cross & Co., Ltd.—Various CGB. motors and auto-starters, also one 20-H.P., 568 FFB. and starting rheostat.
Thos. Barlow & Sons.—Two 312-H.P. slip-ring motors, pulley transformer and switch pillar.
Powell, Duffryn & Co.—Elliot pit pump ventilation.
Daimler & Co.—Switchgear.
City of Santos Imp. Co.—Spare parts for equipments supplied.
Metropolitan Railway Co.—One 1,200-KW. rotary transformers, switch gear, &c.
Stalybridge Trams.—Transformers.
West Ham Corporation.—Transformers and switchgear.
Strain & Robertson (Alianza Co., Ltd.).—Transformers and switchgear.
Daimler & Co.—Transformers.

Hungary.—It is reported that Messrs. Ganz & Co., of Buda-Pesth, are, in conjunction with the Siemens-Schuckert Co., preparing to establish a plant in that city for the manufacture of electric cables.

Catalogues and Lists.—Messrs. Falk, Stadelmann and Co., Ltd., 83 and 87, Farringdon Road, London, E.C.—Advance copy of 32-page catalogue of "Efesca" outdoor lighting fixtures, two examples of which we illustrate in our "New Devices" pages this week.

Messrs. Veritys, Ltd., 31, King Street, Covent Garden, London, W.C.—Sixteen-page list of "Aston" electric radiators, luminous and non-luminous, with illustrations and prices. We show a representative type in our "New Devices" to-day.

The Westinghouse Cooper-Hewitt Co., Ltd., 151-2, Great Saffron Hill, E.C.—Referring to our comment on their "Better than Daylight" booklet, the company have sent us a list of users, such as we suggested might with advantage have been included in the booklet. This list is issued as a separate small brochure, and shows that a remarkably large number of installations has been carried out in this country.

The British Aluminium Co., Ltd., 109, Queen Victoria Street, London, E.C.—Reprint No. 117 relating to 110,000-volt aluminium transmission lines. Leaflet relating to aluminium panels, ceilings, &c., for railways and tramways.

Messrs. Tetley & Co., Falcon Electrical Works, Salford.—Price leaflet of the new "Star" switch for 600 volts.

The Unbreakable Pulley and Mill Gearing Co., Ltd., West Gorton, Manchester.—Leaflet with description, illustrations and prices of the Cooper roller bearings.

The Hoffmann Manufacturing Co., Ltd., Chelmsford.—Circular No. 303, consisting of eight pages of finely printed art illustrations, showing "Hoffmann" ball bearings applied to electrical machinery.

The Westminster Tool and Electric Co., Suffolk House, Laurence Pountney Hill, London, E.C.—Illustrated list, giving prices and particulars of the "Westminster" electric cookers, breakfast cookers and boiling plates, which they are now bringing under the notice of central station engineers.

Messrs. Hans Renold, Progress Works, Brook Street, Manchester.—Pamphlet comparing driving chains with belts, and giving the advantageous results of conversions to the former. Copies of the list can be obtained on application.

The Electric Adv. Co., 32, Union Square, E., New York City.—Illustrated leaflets regarding flashing electric sign projectors.

Messrs. Crossley & Hamer, Broad Street, Halifax.—Leaflet describing a new lampholder cord grip.

"L'Air Electrique," 38, Rue de la Folie-Regnault, Paris.—Illustrated lists of electric fans of all kinds, small motors, &c.

Messrs. Pope's Electric Lamp Co., Ltd., Willesden, London, N.W.—Catalogue showing admirably on art paper their various shapes and sizes of electric lamps, and setting out plainly beside the illustrations, the pressures, candle-powers, diameters and lengths. Miniature round bulb lamps for motor-car and omnibus lighting, train lighting lamps, "Focus" lamps for motor-car headlights, festoon lamps, mushroom, plain and twisted flame shapes, torch flame lamps, large tube lamps for shop window lighting, high candle-power lamps, and standard bulbs are all shown. Prices are tabulated at the end of the list.

The Victoria Dynamo and Motor Co., Craven House, Kingsway, W.C.—Twelve-page catalogue, giving specification and description of their bipolar and multipolar D.C. dynamos and motors, also tabulated powers, speeds, &c., and small half-tones of protected, enclosed, and totally enclosed types. Loose lists give illustrated information and prices regarding builders' hoists (friction or spur geared), two and three-phase A.C. motors, electric pulley blocks, small and large electric motor lift gears, and push-button switches for lifts.

Messrs. Baxendale & Co., Ltd., Miller Street, Manchester.—64-page catalogue giving illustrations, brief notes, and particulars of prices, of a variety of electric bells and bell installation parts, among these being indicators, burglar alarms, factory and colliery bells, pushes, wires, batteries, &c., some further lines in the list being speaking tubes, lightning conductors, medical batteries, &c. Some pages are occupied with connection diagrams.

Mr. G. Braulik, 8, Lambeth Hill, Queen Victoria Street, London, E.C.—Catalogue of close upon 70 pages (Section T, ninth edition), containing illustrations, particulars and prices of a very full variety of telephones, including receivers and transmitters, micro-telephones, domestic telephones, battery and magneto call telephones, railway and portable telephones, gas and water-tight telephones, magneto call and central battery P.O. telephones, switchboards, bells, &c. At the end a number of pages are devoted to diagrams of connections.

Messrs. T. Harding Churton & Co., Atlas Works, Water Lane, Leeds.—Catalogue of 16 pages containing full descriptions of polyphase induction motors and single-phase motors, also tables of outputs and prices. A number of well-printed half-tones show the motors, their parts, starters, &c.

Messrs. Siemens, Bros. & Co., Ltd., Caxton House, Westminster, S.W.—Catalogue (26 pages) in the firm's now well-known standard form and style, in which is given information, brought up to date, regarding Siemens-Obach dry cells for general and ignition purposes, also ignition coils, Hellesen dry cells, Dura cells, Siemens transport cells, &c. There are some full notes on the employment of dry cells and dry cell batteries for ignition purposes.

Bankruptcy Proceedings.—W. F. Flint, electrical engineer, 77, Haworth Street, Hull.—Receiving order made September 21st on debtor's petition. First meeting, October 5th: public examination, November 13th.

Exhibitors at Olympia.—The J.-L. Manufacturing Co., Ltd., of Southall, have a large stand in combination with Submersible Motors, Ltd., in the gallery, Nos. 317 and 318. They were delayed in completing their arrangements for a stand until the last moment, hence their name did not appear in our last week's list.

Manufacturers and Wiring Work.—Messrs. Johnson and Phillips, Ltd., ask us to announce that owing to representations which have been made to them by some of their contractor friends, they have decided not to tender, or accept orders, for ordinary wiring work. Should any work of this nature be included in any orders that they may receive for complete plant and cable installations, they propose, where possible, to sublet it and distribute the work among their contractor customers.

German Export Trade.—The Imperial Statistical Department is carrying out a much needed inquiry as to the most appropriate method of estimating the value of goods in the German export trade. Questions such as whether the factory price should be recorded only, or the frontier price (*i.e.*, plus railage, insurance, &c.) are to be debated. Who is to furnish the bases of estimates of value is also to be settled (*i.e.*, whether the manufacturer or the Customs officials). The advisability of similar reforms in the import system is likewise to be considered. From the purely statistical point of view, such an inquiry is eminently justified, and if an international character were given to it so much the better; the German restricted view, however, is that such reforms as may be initiated "belong to the most important preliminary measures of the looming new regulation of Customs arrangements and treaties of commerce," and will probably involve a readjustment of duties on many import and export articles.

Our Lamp Imports and Exports.—Commenting on the English Customs statistics for July, the *Elektrotechnische Zeitschrift* remarks that the only items calling for comment are the imports of glow lamps, which have shrunk to the extent of 25 per cent., so that the imports in relation to the total consumption are now quite insignificant. That the exports of glow lamps are so inconsiderable, arises from the fact that most of the English metal-filament lamp works are only licensees of German manufactories, and therefore are unable to export.

Russia.—A St. Petersburg cotton spinning mill manager, who is at present in Farnworth (Bolton) on a holiday, informed a correspondent the other day that the owners of many cotton mills in St. Petersburg are contemplating adopting electric driving in the near future, and are making inquiries of English firms respecting cost, &c. The manager in question has been shown through one of the electrically-driven factories in the Bolton district, and expressed himself satisfied with what he saw. The great mills of Messrs. J. & P. Coats, the famous Scotch thread firm, in St. Petersburg, are electrically equipped.

The Constantinople Electrical Syndicate.—It is announced that the meeting to formally constitute the Belgian syndicate or trust—the Consortium de Constantinople—will be held at the beginning of October. The board of directors will include representatives of the Deutsche Bank, the Dresden Bank, the Orient Bank, the Berlin Electrical Enterprises Co. and the Zurich Bank for Electrical Enterprises. The syndicate is to pave the way for the formation of the Belgian company which is to be established on the acquisition of the underground electric railway concession for Constantinople. The capital of the company, which is only to be raised gradually, is to be divided into three classes. The first will comprise £720,000 in shares and £720,000 in 4½ per cent. bonds, and will represent shares in the Constantinople Tramways Co. and shares in the Galata-Pera Tunnel Railway Co. The second class will also be formed of £720,000 in shares and £720,000 in bonds, and is intended for the taking over and working of the concession for the underground railway previously mentioned. In the third case the shares will total £360,000, and the bonds £360,000, the proceeds being for the Ganz electric lighting concession and the gas works. The aggregate capital will amount to £3,600,000.

LIGHTING and POWER NOTES.

Acton.—At the last meeting of the U.D.C. the accountant, in reply to a question from Councillor Ince as to what were the various purposes for which electricity was purchased by the Council during the year ended March 31st last, and what was likely to be the consumption during the current year, gave the following statement: For the year ended March 31st, 1911, lighting, £1,190; heating and power, £547. Estimate for 1912, lighting, £1,087; heating and power, £722.

Argentina.—The Anglo-Argentine Electric Co. is in treaty with the Mercedes Electric Light Co. for the purchase of its business. The price mentioned is $440,000.—*Review of the River Plate.*

The Municipality of Punta Alta (Puerto Militar) has under consideration an offer of Messrs. Parcus & Co. to establish an electric light station. As the tariffs are considered high, it is probable that a municipal station will be erected.

Australia.—Owing to the great increase in the demand for electricity supplied by the Electric Light and Power Supply Corporation, Balmain, Sydney, it has been found necessary to purchase additional machinery, and a Willans mixed-pressure turbine, with a British G.E.C. generator of 1,000 KW., is to be installed. In the last half-yearly report of the corporation the directors stated that the consumers in Balmain totalled 299 and in Newtown 178, that the municipality of Petersham had entered into an agreement with the company for the supply of electric light and power, and that several large applications for installations had been received. To meet the large extension of the company's area of operations, together with the purchase of additional machinery, an increase of capital had taken place.

The Sydney city electrical engineer, Mr. Forbes Mackay, has submitted an interesting report to the Council, asking a definite expression of opinion on the policy to be pursued by the electric light department. He says: "It is doubtless the wish of the Council that the department should be so conducted as to secure two results—(*a*) that the supply shall be as reliable and as effective for all purposes as practicable; (*b*) that the undertaking should be self-supporting financially. But there are two, or perhaps three, policies, any of which may be pursued, to a reasonable extent, without risk of failing to secure (*a*) and (*b*). No. 1 is to sell electricity at the lowest possible price for all purposes, to extend the mains in all directions, and to push the sale of electricity to the uttermost, not with the intention of making a profit, but for the purpose of helping the manufacturers of the city, and superseding obsolete, dirty and unwholesome methods of lighting and the production of power. No. 2 is to sell electricity at the price which will bring in the largest net profit, to extend the mains only where a remunerative return is certain, and generally to conduct the undertaking as a money-making concern pure and simple. No. 3 is a combination of Nos. 1 and 2. It is to aim at making a profit, but to limit that profit to, say, a definite percentage of the capital expended, the consumers to get the benefit of any surplus in reduced charges, &c." He adds: "I believe that the City Council will make a mistake if any policy but that which I call No. 1 is followed. The benefit to the inhabitants of the metropolitan area of a cheap and reliable supply of electricity will be much greater in value, though less impressive on paper, than the few thousands, or tens of thousands, of pounds per annum which might be earned as profit by selling electricity at the highest price which can be got for it. There is nothing which will more certainly stimulate the growth of Sydney as a manufacturing and business centre than a cheap supply of electricity."

Axbridge.—The R.D.C. has consented to an extension of the area supplied by the Wedmore Electric Light and Power Co. towards Cocklake, by means of overhead wires.

Bexley.—An assisted wiring scheme has been adopted by the U.D.C., which does not apply to less than eight lights. The Council's maximum contribution towards the cost of any installation will be £1 per point, with no charge for supervision of the work of installation, which will include wiring, fittings and the first supply of lamps. The maximum advance under the scheme is £50, and the minimum £8.

Braunton.—The establishment of electricity works by Messrs. Crompton is now definitely assured. The shares in the local company formed have been allotted, and it is hoped that energy will be available by Christmas.

Bury.—The generators at the Chamber Hall power station were coupled up to the mains, to assist the Rochdale Road works, about a month ago, and a regular supply from the new works has since been in daily operation between 8.0 a.m. and 6.0 p.m., with the exception of Saturday and Sunday.

Canada.—The provincial Government of Quebec has adopted a new policy as to water powers belonging to the Crown. In future no such water power will be definitely sold. Twenty years ago these water powers were allotted for nothing. Ten years ago such water powers as the Shawinigan and Grand Mere Falls were sold for $50,000. Now they will not be sold at all, but rented in long leases of 99 years. The Minister of Crown Lands, Hon. S. M. Ollard, has just decided to offer at auction this present month 10 water powers situated in different portions of the province.

The Ottawa Municipal E.L. authority has completed the measurement of the houses in the city, and the new scale of lighting will go in force next month. This scale provides for a flat rate of 4 c. for each 100 sq. ft. of floor space and 3 c. per unit by meter. This will be a big reduction over the former meter rate of 8 c. per unit. The Ottawa Electric Co., which lights, probably, two-thirds of Ottawa has adopted the rates of the municipal authority, thus giving customers the reduced rates. The City of Ottawa is negotiating for the purchase of Chatts Falls water power. This great waterfall is capable of developing 141,000 H.P., and is situated 20 miles from Ottawa. It is probably the largest power in Ontario outside Niagara, and is conveniently situated. It is not probable that Ottawa will ever develop more than a quarter of this power, as she cannot use it. It is intimated that 20,000 H.P. can be developed at Chatts Falls at a cost of $7·80 per H.P. A new street lighting system is being inaugurated in Ottawa, clusters of five tungsten lamps being mounted on ornamental posts placed 100 ft. apart. The property owners pay 5 c. a foot frontage; thus, a 20-ft. frontage pays $1 a month for the privilege of these lights.

Carlisle.—A L.G.B. inquiry has been held at the Town Hall relative to the Council's application for sanction to borrow £9,755 in connection with the electricity works. The amount is made up as follows:—Mains extensions, £5,000; Viaduct Unitarian Church (purchase and adaptation), £3,000; new storage battery, £1,755. Statistics as to the population, rateable value, and indebtedness to the city having been supplied, the officials explained the nature of the proposals, and replied to the inspector's questions. With regard to the item of £1,755, the city electrical engineer (Mr. Allen) stated that the output had increased to such an extent during the past two years that the present battery was totally inadequate to meet their requirements. No opposition was offered at the inquiry.

Carnarvon.—The T.C. has further considered the scheme for lighting the streets by electricity, together with a communication from the National Electric Construction Co., offering to fix along two or three of the main thoroughfares lamps providing 20,000 C.P., or 400 per cent. more than is at present obtained from gas lamps. It was estimated that this arrangement would cost £190 per annum, representing an increase in the rates of about 1d. The Council agreed to accept a scheme for lighting certain parts of the town on the understanding that the cost to the ratepayers does not exceed £100 a year

Chester.—Mr. A. C. Hurtzig, the expert engaged to report on the scheme prepared by the city electrical engineer for utilising the water-power at the Old Dee Weir for generating electricity, has approved the scheme, which he is satisfied will be a source of revenue to the Corporation. Three members of the Electricity Committee have been appointed to confer with the Dee Fishery Board on the project as it affects the interests of that authority. In his report, Mr. Britton stated that the existence of a hydro-electric installation on the site of the Old Dee Mills should not in any way affect the surrounding property or the rights of the Fishery Board. The site is conveniently situated for the transmission of electrical energy, either to the existing mains at the Cross during heavy demands for current, or to the electricity works, where it would be distributed or stored during light demands. The data upon which Mr. Britton made his proposals were based to a certain extent upon tests made of the flow of water by the river authorities and himself. The average flow was taken as 240 million gallons per day, and it was proposed to deal with it by putting down three turbines of 225 H.P. each, which would be capable of dealing with practically 600 million gallons. A capital expenditure of £10,000 is proposed, made up as follows: Two cofferdams, £320; clearing of site, £250; excavations and buildings, £2,000; three turbines, £2,830; three dynamos, £1,600; switchboard, £300; cable to electricity works, £1,500; sluices, £380; strainer racks, £220; pumping during construction, £200; contingencies, £400. In addition, there will be £1,059 operation and maintenance expenses. With regard to the disposal of energy, the great variety of trades and businesses now connected to the electric supply make it necessary to generate current at all hours of the day and night, therefore the almost continuous supply of energy from a plant of the capacity suggested can be disposed of completely. Mr. Britton takes the income from the units supplied by the plant at 1d. per unit, which gives the following financial results: Income, 1,021,490 B.T.U. at 1d., £4,297; complete cost, £1,059; surplus balance per annum, £3,238. If the scheme is approved, application will be made for a loan of £5,000.

Combe Martin.—The P.C. has decided to interview the representatives of a firm of engineers with the view of the electric light being introduced into the parish.

Continental Notes. — AUSTRIA. — The negotiations which have for some time past been under way between the Oesterreichische Union Bank and the Vereinigte Elektricitäts A.G. with regard to the purchase from the former of its generating stations and railway lines have reached a satisfactory conclusion. The latter company, which, as may be recalled, sold its Vienna works last year to the Austrian branch of the Brown, Boveri concern, is now only a trust corporation. It has taken over from the Union Bank the power station at Bielitz, near Knittelfeld; the generating station at Wels (Upper Austria); the electric lines from Teplitz to Eichwald; and the Teplitz Electric Works and railway company, as well as the Bielitz to Zigeunerwald electric lines. In connection with the transfer of these concerns, the Vereinigte Elektricitäts A.G. has increased its capital to 10,000,000 kronen, with a further 5 millions by the issue of debentures bearing interest at 4½ per cent.—*E.T.Z.*

FRANCE.—The city and port of Brest is to be lit by electricity, the Council of State having approved of the contract with this end in view provisionally come to between the T.C. and the Société Electrique. The station will be erected in the commercial harbour.

The Compagnie Electrique du Midi has under consideration a combination whereby 27 rural communes and thermal establishments in the Cantons of Olette, Mont Louis and Saillagousse, in the Eastern Pyrenees, which have made applications for an electric service, may be supplied from the company's station at Cassagne.

La Société Douaisienne de Distribution d'Energie Electrique is the name of a new company which has lately been formed at Douai, with a capital of £12,000, to undertake the supply of electrical energy for lighting and power purposes to a number of small towns and villages in the Douai district.

Croydon.—The T.C. has decided to lay a new feeder to the sub-station in Drummond Road for the direct current supply, at a cost of £1,700.

Durham.—The County of Durham Electrical Power Distribution Co. has fitted up an electric villa at Cleadon, a village some three miles to the north of Sunderland, and about the same distance from South Shields. The house has been handsomely furnished and equipped with suitable electric lighting, heating and cooking appliances. A room is set apart for the practical exhibition of electrical cooking, and a "Tricity" cooker is installed.

Ellesmere Port.—The U.D.C. is taking the preliminary steps to obtain an electricity order. Ellesmere Port is a busy little industrial place, now with rather over 10,000 inhabitants, which has sprung up at the junction of the Shropshire Union Canal with the Manchester Ship Canal. The Shropshire Union Co., whose system is leased to the L. & N.-W. Railway Co., has a perpetual monopoly of the gas supply. The charge was for long 7s. 6d. a thousand. It is now 4s., which the inhabitants think compares very unfavourably with 10d. (for power) charged at Widnes, just across the Mersey.

Epsom.—The U.D.C. had a long discussion at its last meeting on a recommendation of the Lighting Committee that it should call in an expert to advise on the installation of a Diesel engine at the electricity works. The chairman stated that the whole of the output could be put upon such an engine, that wages would be saved, and that the L.G.B. favoured it. The recommendation was eventually adopted, but with the addition of the words, "or any other plant." Another motion instructing the electrical engineer to submit an estimate of the cost of installing and maintaining an electric pumping plant at the waterworks, as an alternative to the purchase of suction gas plant, was defeated.

Fife.—Two paper mill installations have been completed within recent months, one at Fettykill Mills, Leslie, Fife, and the other at Dalmore Mills, Midlothian. The British Electric Plant Co., Ltd., Alloa, carried out the work. At Fettykill, three paper-making machines are driven by power obtained from a 400-KW. set coupled direct to a Howden engine. To each paper-making machine is fitted one of the company's patent variable speed motors, thus enabling the speed of the machine to be controlled from 20 to 200 ft. per minute. Variable speed motors drive the super and glazing calenders, and constant speed motors drive beaters. At the Dalmore Mills, a 300-KW. set is installed, with a Howden engine and a surface condenser.

Frome.—Considerable extensions are to be made at the electricity works, consisting of the erection of another cooling tower, the provision of another boiler, and a 300-H.P. reciprocating engine and condensing plant. The object of the extensions is to effect an improvement in the running of the station, and to enable the contractors to supply power to the large cloth mills at Wallbridge.

Herne Bay.—A meeting of ratepayers, called to consider whether the E.L. order shall be carried out by the Council or by a company, has come to no definite decision, but agreed to the matter going back to the Council, with the idea that when other terms have been obtained, another public meeting shall be called. The preponderance of opinion was in favour of the order being carried out by public tender.

Honiton.—The T.C. on Monday sealed an agreement with Messrs. Purvis, of Exeter, for the installation of the electric light in the borough.

Llangefni.—The U.D.C. has decided to enter into a contract with the electricity company for public lighting during the coming winter.

London.—Stoke Newington.—On Thursday night last week the electric light was switched on at the Library Hall by the Mayor, who defrayed the expenses as a Coronation gift.

Manchester.—The competition between the Manchester Gas and Electricity Committees is resulting in a brighter light for the city. The Electricity Committee has come forward with an up-to-date electric arc lamp, which, it claims, absolutely outshines any gas light in existence. In order to give an unprejudiced judgment on the merits of the rival lights, the Electricity Committee on Monday night decided to make a round of the streets before giving a verdict in favour of electric light. It inspected the lights in Piccadilly under a depressing rain, and voted the arc lamp a great success. It walked along Mosley Street and found the high-pressure gas lamps even more depressing; it emerged on Albert Square, where gas and electricity tried to outshine each other, and said that the gas lamps were scarcely discernible. It is intended to have a test made of the two lights as regards cost and illuminating power, with the object of putting the respective advantages and disadvantages of the rival lights before the City Council. Councillor Kay, late deputy-chairman of the Electricity Committee, has been appointed Chairman of the Gas Committee, and Councillor Dagnall has been elected deputy-chairman of the Electricity Committee.

In Albert Square 16 of the 6-ampere enclosed arc lamps have been replaced by a similar number of 10-ampere "Metroflam" arcs by Messrs. Johnson & Phillips. The height of the new flame arcs is 22 ft. 6 in. from the ground level, against the 17 ft. of the existing arcs. The maximum C.P. emitted by each of the new "Metroflams" is not less than 2,500, against 850 C.P. of the older lamps, so that there is an increase of 35,000 C.P. in the aggregate lighting of the square, which has greatly improved the illumination. In Portland Street central lighting has been adopted as far as possible by means of arc lamps suspended from duplicate cross-span wires, attached to rosettes fixed on the front or corners of the buildings. Where this course has not proved feasible, side poles with long arms are fixed so as to bring the lamp central with the street. Provision is made by means of tightening gear for the raising or lowering of the lamps to suit the best conditions for illumination. The maximum candle-power of each of the lamps is not less than 3,000.

Merthyr Tydfil.—The Electric Traction Co. has informed the T.C. that it has decided to embark upon an extensive scheme for the development of its system. A main feeder is to be run along the mountain top to Treharris and district, and by this means it is hoped to supply current to Bedlinog. The T.C. has approved of the scheme, which will now be laid before the B. of T.

Plymouth.—The Works Committee of the B. of G. has decided to have the laundry lighted by electricity instead of by gas.

Sowerby.—The P.C. has accepted the tender of the Northern Counties Electricity Supply Co. for lighting 74 lamps for three years at £105 per annum.

South Africa.—Owing to faults constantly occurring on the present arc lighting cable, which is of the lead-covered type laid direct in the ground, the Johannesburg electricity department proposes either to renew the cable entirely or to discard arc lighting altogether, and lay new cables for lighting the town with metal-filament lamps The first scheme would require approximately 44,000 yd. of cable at an estimated cost, including laying, of £4,800. The second scheme, including 400-C.P. lamps, is estimated at £8,379. In the comparison of the annual cost, there is an advantage in favour of the second scheme of £1,214, the figures being—present arc lighting £10,300, proposed metallic-filament lamps £9,086.

West Ham.—The electrical engineer reports that in accordance with the instructions of the Electric Light and Tramways Committee, he continued his negotiations with the London District Secretary of the Electrical Trades Union, with regard to their complaint that the Council were not observing Trade Union conditions with reference to certain classes of workmen engaged in the electricity undertaking, and that he has settled the whole of the points in dispute. The Committee reports having settled the claim of the Rowland Hill Permanent Building Society, by the payment of the sum of £275, including costs, without in any way admitting liability, for injury done to certain houses belonging to the society in Tucker Street, and other loss of rents due to an alleged nuisance arising from the generating station at Canning Town.

Whitworth.—At a special meeting of the U.D.C. on the 22nd inst., Mr. G. R. Peers, consulting engineer, of Manchester, was engaged to prepare a report and scheme regarding the carrying out of the electric lighting provisional order obtained by the Council some time ago.

Widnes.—Electric lighting is to be installed in the public library at a cost of £86.

Windsor.—Electric lighting is being installed at Cumberland Lodge, the Windsor Park residence of T.R.H. Prince and Princess Christian of Schleswig-Holstein.

Wirral.—When the Wirral Joint Hospital Board decided upon a scheme for the electric lighting of the hospital at Clatterbridge, it obtained the assistance of the Hoylake and West Kirby U.D.C.'s electrical engineer in the preparation of the scheme. It was reported at the last meeting of the Hoylake Council that the Hospital Board had applied for the electrical engineer to supervise the installation, and the Electricity Committee recommended this. Mr. Case thought they were not quite doing the right thing, as this should be given to a private firm, and he protested against the introduction of this method. Mr. Little pointed out that the engineer having made certain suggestions tending to economy as well, they thought he should finish the work. By a majority, the recommendation was approved.

TRAMWAY and RAILWAY NOTES.

Bingley.—At a meeting of the U.D.C. held last week, a deputation was appointed to discuss with the Bradford Tramways Committee the suggested extension of the tramways from the present terminus at Nab Wood to Crossflats.

Blackpool.—Remarkable figures were presented to the Tramways Committee recently, the quarterly report showing gratifying increases all round. Compared with last year, there was an increase of over a quarter of a million passengers carried (265,431), an increase of 3¾d. in the receipts per car-mile, and the total receipts of £12,237 showed an increase of £2,247. The total number of passengers carried was 1,704,832. From April 1st to September 13th the total number of passengers carried was 6,895,955, an increase of 963,403. The total traffic receipts were £46,421, an increase of £6,137, and the receipts per car-mile had jumped up by 3d.

Bolton.—The Darcy Lever Committee has had before it plans prepared by the borough engineer, showing a proposed extension of the tramway from the present terminus to Hacken Lane. Consideration of the matter was deferred.

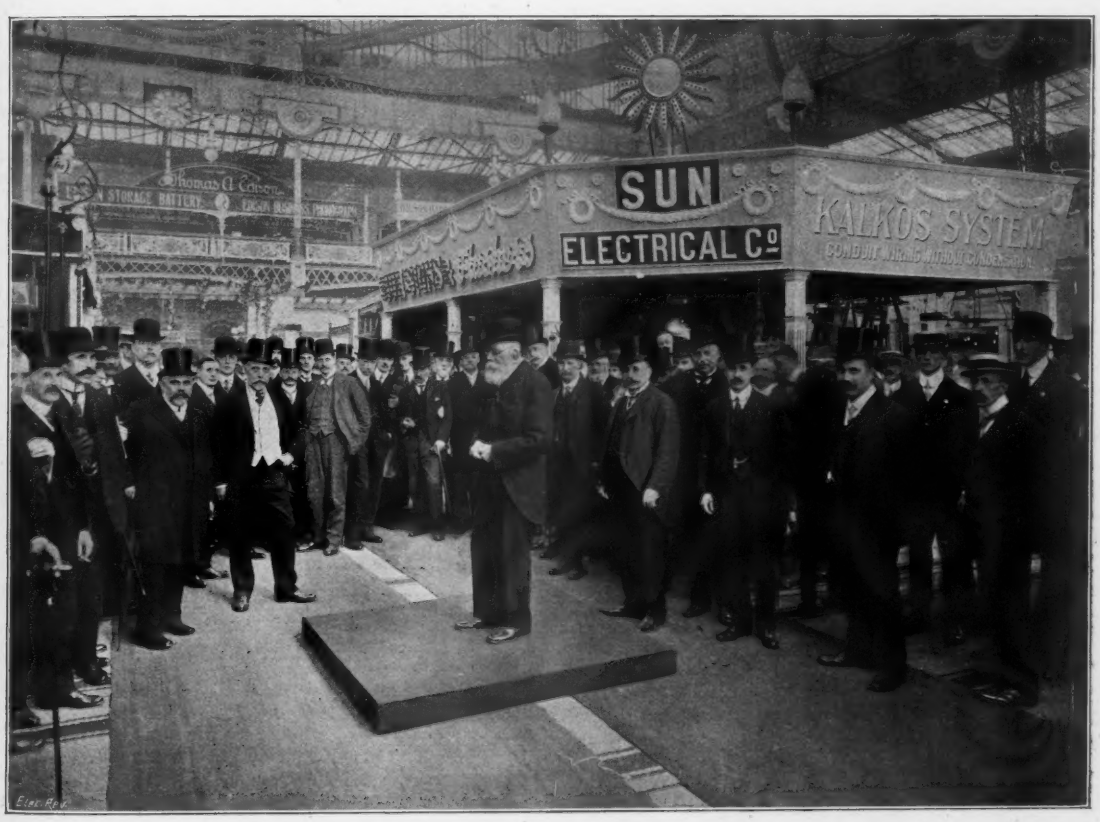
Doncaster.—The Tramways Committee of the T.C. has decided, by seven votes to four, not to run a service of cars on Sundays.

(*Continued on page* 521.)

The Inaugural Banquet.

The anticipatory dinner which took place on Friday evening last was thoroughly enjoyable, and we hope that its success may prove a happy augury for that of the Exhibition to which it owed its origin. There were about 170 guests, including, of course, most of the leading organisers of the undertaking; the entertainment provided was in all respects both ample and excellent, and the party did not break up until a very late hour. The President (Sir W. H. Preece), we are happy to say, appeared to be in excellent health and spirits, although, as he confessed, he attended the dinner in opposition to the advice of his medical adviser and his family

In his reply, Sir W. H. Preece referred to his connection with previous electrical exhibitions, and said that on January 1st, 1912, he would celebrate his diamond jubilee as a civil engineer, having spent 30 years in private work and 30 years in the service of the State. Seeking health in South Africa, he had seen in Johannesburg the energy and vigour of the British engineer, and was convinced that we were well ahead of our competitors in scientific progress. He made the interesting announcement that Lady Kelvin would shortly present to the Institution of Electrical Engineers a bust of Lord Kelvin. Referring to the approaching ceremony,



THE OFFICIAL OPENING BY SIR WILLIAM PREECE.

After the loyal toasts, Sir Albert Rollit proposed "Success to the Exhibition," in characteristic style, producing quite new stories from his inexhaustible stock of jest and anecdote. He paid a well-earned tribute to the public services of the President, and eulogised the science of electricity as one of the most universally useful agencies known to mankind. Exhibitions, he said, were a most convenient mode of advancing industry, and stimulated honourable rivalry. No more appropriate site could have been found, for it was from Olympus that Jupiter hurled his thunderbolts.

Sir William expressed his admiration for the work done by Mr. Butler, the chairman; Mr. Hawes, the secretary; and Mr. Benjamin, the organising manager, in the preparation of the Exhibition.

Proposing "The Electrical Supply Authorities," Mr. Hirst said he was satisfied that this Exhibition was going to be a bigger success than any of its predecessors. These exhibitions were largely due to the initiative of the supply authorities; they succeeded in 1905, did better in 1908, and would now put previous results in the shade; but what of future exhibitions? He threw out several interesting suggestions calculated to attract the public, and to render

the next exhibition unique. For instance, they should try to make the hall a sea of light; they might divide the show not into individual stands, but into great specialised departments for lighting, power, &c. Our central stations, he claimed, were far in advance of any abroad, and the manufacturers were indebted to the supply authorities for their broad-minded assistance and encouragement. The thirteen London companies had formed a community of interests, of which Mr. Walker was the most able organiser, and they had joined in an exhibit which, he thought, would please them all, thanks largely to the excellent services of Mr. Peach; it would be one of the most interesting of all the exhibits. Alderman Pearson, also replying, said that municipal men were not so anxious for cheapness as for excellence of design, and they did not grudge manufacturers a fair profit.

As the chairman had to leave at this stage, Mr. Butler proposed his health, which was accorded with musical honours.

Mr. F. H. Nalder proposed "The Press," and Mr. T. E. Gatehouse replied; and lastly, Mr. W. M. Mordey toasted "The Visitors," for whom Mr. A. Siemens and Sir Hiram Maxim responded.

Saturday's Opening.

As had been anticipated, the ceremony on the opening day was quite a formal affair. To the public the doors were thrown open early on the Saturday morning, but those who visited the Exhibition before two o'clock, in the hope of seeing things in a complete form, would find it necessary to do as the first five outsiders—members of the fairer sex—were compelled to do. You cannot equip a modern exhibition as the ancient Israelites are reported to have built a temple, without the sound of hammer, saw or plane. Hence, some things being not altogether completed in the hall, these ladies, who, perhaps, hoped to see the Electric Home ready for their early visit, and expected to find a quiet hum or a soothing silence beneath Olympia's dome, retreated in fear of the carpenter, the fitter and the floorcloth layer, demanding their money back (to use the words of Sir William Preece) and receiving in lieu thereof new tickets for admission on another day. Some exhibitors seemed to us to have left far too much to be done at the last moment—it were needless now to inquire the reason, but it passes our comprehension why stands that had been arranged for months before were not in a more forward state. The joint electricity supply stands were conspicuous for their nudity and namelessness. However, it is little use expressing regrets now, for nearly a week has passed since then, and by the time these lines are in print everything will be in a perfect state, and remain so until the close on October 21st. At a little after two o'clock, members of the Executive Committee and others assembled near the main entrance, and as these later betook themselves down the main avenue, toward the small platform from which Sir William was to pronounce the Exhibition open, exhibitors and attendants gathered from all directions. Sir Wm. Preece addressed a few sentences to those about him, in the course of which he said that he proposed to ask the Institution of Electrical Engineers to hold a meeting at Olympia some two or three weeks hence, and he would then give them an address on the lessons that they had learnt from the Exhibition. He had now completed—or would do so at the end of this year—60 years incessant service in civil engineering, in that branch which was called electrical engineering. He had this record among them—that during his lifetime he had witnessed the birth of every single development of industrial electricity, and had taken an active part in connection with all of them. Therefore, he hoped that from what he saw around him, and from what he would learn, he would later be able to say something that would not meet with their disapproval. He then formally declared the Exhibition open.

Mr. H. W. Butler, as chairman of the Executive, called for three cheers for Sir William for kindly opening the Exhibition, and these having been given, plus one more because everybody felt like it, the company dispersed to their own or other people's stands.

"Honour to whom," &c.

With justice Sir W. H. Preece, at the inaugural banquet, commented upon the admirable and painstaking work done by the indefatigable organisers of the Exhibition. While the labours of Mr. Benjamin, the organising manager, and Mr. Hawes, the ubiquitous secretary, from their nature could not be concealed, the assiduous attendance of the chairman, Mr. Butler, at headquarters, and the immense amount and value of the assistance that he rendered to his colleagues, are known to but few. Mr. Butler has, in fact, been a tower of strength to the promoters, and has unobtrusively accomplished Herculean tasks, devoting almost his whole time to Exhibition matters. Mr. Bell, too, electrical engineer to the Hammersmith Borough Council, has been burdened with an immense amount of responsibility and manifold worries and anxieties, which he has cheerfully borne with patience and courtesy. He has on this occasion broken all records, having provided no fewer than four different systems of supply of electricity to the exhibitors, as detailed in our last issue. It is interesting to note that Mr. Bell was in charge of Ruston Proctor's exhibit in the first Crystal Palace Exhibition, and he, of course, supplied the energy for the 1905 show at Olympia, as well as for the present one.

The Present Position of Electric Heating and Cooking.

[COMMUNICATED.]

The attention of the electrical world is at the present moment fixed upon the Exhibition at Olympia. The attention of our friend the enemy will doubtless also be claimed to a certain extent by the same event. That the non-technical public will be attracted goes without saying, for it has been found over and over again, in many large centres of population, that an electrical exhibition has about it a subtle fascination that proves irresistible to the layman, whether a user of electricity for domestic or business purposes or not.

The present exhibition affords a splendid opportunity for everyone to observe the great strides that have been made since the exhibition in 1905. At that time the metal lamp was slowly being brought towards perfection. Flame arc lamps were a pleasing novelty. The application of electricity for motive power was already fairly well advanced, though the magnitude of the work now undertaken by electrical means was only vaguely forecasted.

Electric heating existed; there were radiators of several kinds, and the well-to-do citizen could afford to run one at odd moments in his bedroom or drawing-room. A few hot-plates, irons, kettles, jugs, and the like, were to be found. They were regarded with a polite and rather sceptical interest, as a freakish excursion of some enthusiastic electrician. Electric cooking might come in the very vague future, it was thought, but no one placed much faith in it, either from the consumer's point of view, as a useful household aid, or from the electricity supply point of view, as a useful means of improving the load curve.

It will be both useful and interesting to survey the position which the application of electricity for the purposes of heating and cooking has now reached.

The only principle which is nowadays considered of any importance from the practical point of view is that of heating by resistances. Formerly the arc was applied for heating small crucibles, flatirons, cigar lighters, brands, and so on, but the arc system is now only in use for large industrial purposes. The high temperature, and the necessity for skilled attention, made it useless in the domestic sense. Water was sometimes boiled by the passing of an alternating current through it, but the presence of chemical action rendered this method useless. This system is also used industrially, where an alternating current of electricity

is passed through a molten salt, such as barium chloride (for high temperatures) or calcium chloride (for lower temperatures). Such a hot salt furnace is used for hardening tools. The principle of induction heating, where there was a coil used as a primary winding, and around the coil there was placed a short-circuited secondary, is nowadays confined to certain kinds of furnaces for industrial work. Most of these systems are only applicable on alternating circuits, whereas the resistance system can be used for both alternating and continuous currents. Its universality of application is one of the many arguments in its favour.

The well-known radiators for heating rooms, which can be procured in so many forms and at all prices, are examples of resistance heating. On the Continent of Europe several large firms use central heating systems worked electrically. Fresh air is drawn in from outside, cleansed, and blown through pipes to the ventilators of the various rooms to be supplied. In the ventilators are placed electric heaters, so that the air supply can be regulated as to amount and temperature in the simplest possible manner. It is clearly a great advantage, not possessed by any other system of central heating, to be able to control each room individually.

In large offices and packing rooms electric sealing-wax heaters are frequently used. Lead pots, glue pots, soldering irons, stamps and brands are all largely employed. Printers often use electrical means for warming lithographic presses. Laboratories use the same means for obtaining a constant temperature for heating bodies. Many laundries are equipped throughout with all kinds of irons electrically heated. Electric bedwarmers will prove very acceptable now that the colder weather is coming, and they are largely used both in private houses and in hospitals. In hospitals there may also be found sterilisers and inhaling apparatus electrically heated, as well as incubators for germ culture. The ripening of fruit may be carried out electrically. The minor applications of electricity for heating, as for shaving pots, curling tongs, heaters, and other little devices tending to the increase of personal comfort are almost too numerous to mention. Many hairdressing establishments use electrical means for producing a current of hot air for drying. When this method is compared with the old dangerous plan of placing a lady's tresses in a gas-heated box, or of applying a hot flatiron to them (in domestic seclusion, this), or of sitting too close to the fire, its advantages are obvious.

Whatever be the purpose for which heat is required, that heat may be produced electrically. The advantages of this course, in the direction of cleanliness, convenience and improved hygienic conditions, are so numerous, and have been set out so often, that their very mention causes restless and futile indignation in the breasts of our gas friends. Of course, we are all aware that the only way to be healthy, clean, cool in the hot weather and warm in the cold, as well as to be wealthy and wise, is to keep the gas burning all day long in all the rooms. The method seems, however, to be lacking in popularity, and possibly those who urge it are a little lacking in—let us say—sincerity.

The use of electricity for heating is frequently attended by the possibility of a reduction in the number of servants, and consequently in the cost of household management. When it is used for cooking this possibility is still more prominent, and there are several avenues through which economy may be effected.

The design of apparatus for cooking food electrically has latterly received a good deal of attention. It may fairly be said that there are two schools of thought in connection with this subject. The one says: "We must proceed on the lines of the gas cooker." The opinion of the other is that we may usefully embark upon methods of our own.

It would be foolish to deny that the gas stove was a considerable advance upon the coal fire for cooking. Further, the coal kitchen range was much better than a pot hung from a tripod over a fire in the middle of the floor. However, the gas oven does not represent the last word in convenience, and a glance at the technical considerations involved may help us to form a conclusion on the subject.

The object to be attained is the production of the right amount of heat, and its direction to where it is required, with the avoidance of all unnecessary waste by radiation, convection and conduction. Conduction can be provided against by suitably insulating the heating element. Radiation and convection losses may be minimised by a little thought.

When we carried out experiments in the college laboratory in which the use of calorimeters was involved, it was necessary to provide against loss of heat by radiation. The means adopted was to polish the outside of the calorimeter. A bright, light-coloured, shiny surface does not radiate heat. A dark, rough surface gives up heat in this way to a considerable extent. If we attempt to minimise this loss of heat by lagging, we greatly increase the mass of material involved, and all this material must be heated before cooking can proceed. What is required is the minimum of mass to be heated, with adequate protection against loss. If these conditions can be fulfilled, electric cooking enters the realm of feasibility. They can be fulfilled, and are fulfilled, by certain cookers.

Much has been heard during the past few months of paper bag cookery. The advantages of this system are quickness and certainty of operation, and reduction of waste. When a joint of meat is cooked by means of gas or coal, it must be taken as certain that from one-quarter to one-third of its weight is lost by evaporation. With electric cooking this loss of weight is reduced to less than 5 per cent., or one-twentieth. Possibly a combination of the two systems, wherein food would be cooked in paper bags in electric ovens, would enable still better results to be obtained.

Grills, toasters, steamers, kettles, jugs, and other isolated utensils for cooking may be obtained, each containing its own heating element. Greater efficiency is claimed for apparatus of this kind, but experience has proved that there is very little in the contention, while the first cost is increased. Further, the attachment of special connections to each separate piece of apparatus is not so convenient. To a certain extent it is necessary to develop along established lines, and to contrive that any modifications shall increase the convenience of using, instead of placing fresh difficulties in the way.

The coal kitchen range has a large area upon which pots and pans may be placed, and when they are sufficiently heated, they are drawn aside a little way. There is no necessity to take them right off, or to alter the fire in any way, or to operate any switch, or to pull off any flexibles or plugs. In electrically heated cookers, one or other of these operations is necessary. Here is a direction in which, by a slight modification, convenience of working could be increased, and it may be commended to manufacturers for their consideration.

Results are now obtainable, and have been published, of tests of electric cooking apparatus which have been carried out over extended periods. When the reduction of waste is considered, together with the increased convenience, absence of smell and matches and other unpleasantness, it is found that electric cooking is no longer a luxury for the few, nor an interesting toy, but a practical every-day possibility for the man of moderate means.

The development of electric heating and cooking is of great importance and advantage to everyone. The consumer benefits, as has been indicated above, by the increased convenience and decreased trouble and expense. The central station benefits by the improvement of the load curve and consequent bettering of financial results. As the load factor is increased, so the output goes up and the cost goes down. This is being increasingly recognised by the reduction of the price per unit for electricity supplied for heating, in many towns.

Electric bath cabinets are installed in many public baths in the larger towns, and their use is extremely beneficial. They have the advantage over the ordinary Turkish bath that one does not breathe a vitiated atmosphere, while the perspiration is considerably more copious. The cost of operation of a large cabinet amounts to less than 1d. per bath.

Enough has been said here to show that the development of the application of electricity for heating purposes has made great advances. It is a matter for everyone's consideration nowadays. The question is no longer—"Can I afford to have electric heating for my rooms, my cooking, my bath and my hot-water supply?" but "Can I afford to be without it?"

SOME OF THE EXHIBITS AT OLYMPIA.—II.

(The figures in parentheses are the numbers of the stands.)

Simplex Conduits, Ltd. (148, 163),
116, *Charing Cross Road, W.C.*

This exhibit occupies a position in one of the main avenues, and has a frontage of 40 ft., with two gangways; it covers the many lines of electric lighting and power supplies now manufactured by the company in addition to their well-known steel conduits. We notice, since the last Exhibition, a great increase in the number of labour-saving accessories available for use with the Simplex system of wiring. For instance, considerable development has been made in the design of porcelain-mounted fittings for junction boxes. Though usually restricted to smaller wires, a number of these interiors are now available for cables up to 19 strands. Fig. 48 shows a switch and light-connecting block for use in circular junction boxes. The merits and convenience of this accessory will be obvious. To render the whole joint watertight, the box may be filled with Chatterton's compound.

FIG. 46.—SIMPLEX OVEN.

The Simplex Co. have specialised on high-grade English-made lighting accessories, paying particular attention to durability and practical convenience. Typical of this class is the detachable "Duplex" ceiling rose shown in fig. 47. The two poles are kept widely apart, and all strain is taken from the flexible and the terminals of the holder and ceiling rose. Wiring may be done wholly at the bench, the pendant being merely plugged into position when the base has been wired to the main circuit. The fitting is specially suitable for heavy pendants and large "Holophane" reflectors in shop-window, factory and similar installations. The weight of the pendant is carried by the screwed metal plug E.

A very exhaustive range of heating and cooking apparatus is on view, from the humble two-pint electric kettle to the electric range capable of dealing with the requirements of 40 people. A smaller oven suitable for an average family of 6 to 8 persons is illustrated in fig. 46, and includes a griller and two boiling rings. The maximum consumption of this apparatus is 25 amperes at 200 volts.

The durability of the company's manufactures is evidenced by a 6-lb. 450-watt iron which has been running continuously at their works from 9 a.m. to 6 p.m. since October, 1910, and has not yet broken down. Irons of from 3 lb. to 18 lb. in weight are made for various purposes.

The company have lately acquired the business of Jesson, Birkett and Co., Ltd., and are now devoting special attention to art fittings of every description. An admirable showroom has been arranged to enable the various products to be exhibited to best advantage. This room is lined throughout with black velvet, and is so wired that any single fitting can be lighted alone, and thus be seen in its proper aspect among other designs. The special exhibit of Holophane fittings is worthy of very careful inspection.

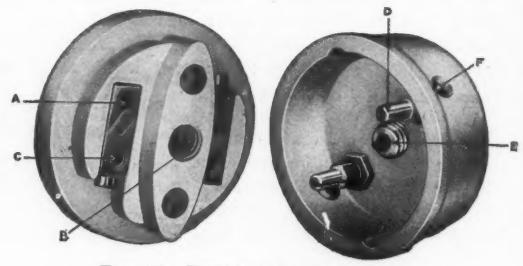


FIG. 47.—DETACHABLE CEILING ROSE.

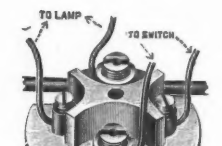


FIG. 48.—SWITCH AND LIGHT CONNECTING BLOCK.

Electric heating is well represented by a dozen typical examples of the company's manufactures. The apparatus shown is mainly of the cheaper type suitable for middle-class houses, but a few fine examples of more elaborate designs are included in the exhibit.

Ozonair, Ltd. (53, 70),
96, *Victoria Street, S.W.*

The whole of this exhibit is shown in operation, and comprises portable apparatus in various sizes and types suitable for private houses, offices, hospitals, &c.; special surgical and dental appliances; laboratory and research equipment; and various complete installations as used in ventilation, water sterilising, brewing, bleaching and food preservation. The design of these ozone generators is such that the electrodes are kept cool, and no oxides of nitrogen are formed even when the concentration reaches 3 gm. per metre of air; generators placed in service five years ago are still perfectly efficacious. The ozone ventilating system is now applied to the stations and tunnels of the Central London Railway and to public buildings all over the world; in ships' holds and

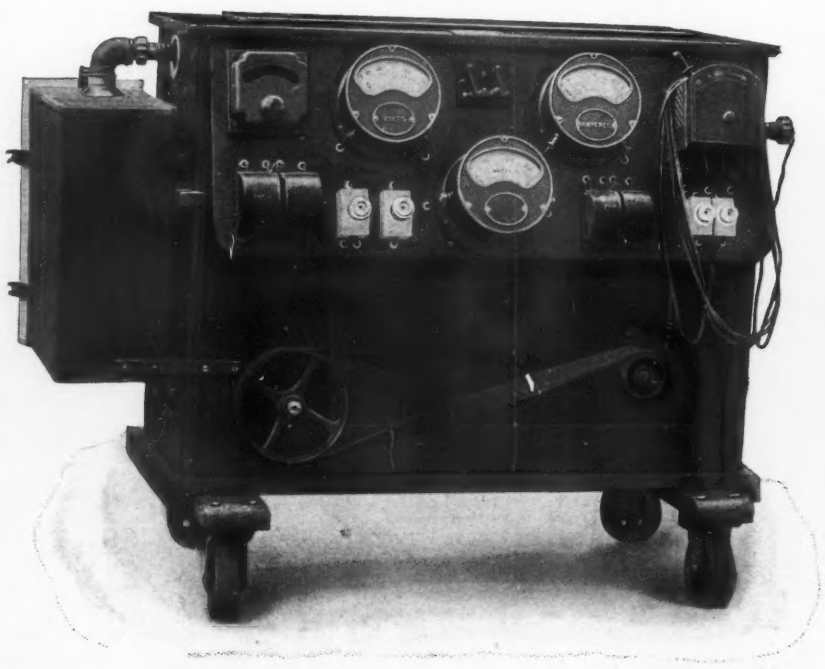


FIG. 49.—PORTABLE OZONISER FOR STERILISING

similar confined spaces ozonised air is of the greatest hygienic value. A water sterilising installation treating 1,000 gallons per hour is shown in operation, and it is important to note that the water is treated three times by the same ozone in three different ways, being economical and complete treatment thus ensured. Ozone

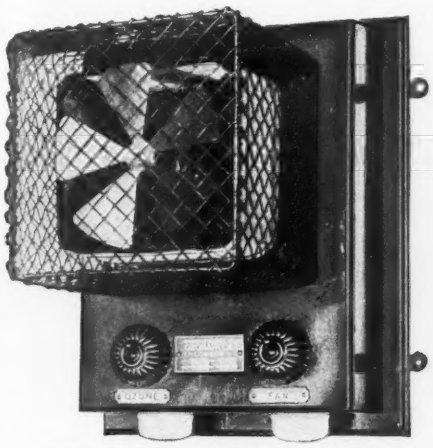


Fig. 50.—Domestic Ozone Generator.

now plays an important part in brewing, and the portable apparatus illustrated in fig. 49 comprises a complete ozone plant, with pressure pump, such as is used for sterilising yeast and brewing vessels and pipes. Oils, fats, waxes and other materials can be bleached by ozone with results unapproachable by any other means. The disadvantages of completely freezing foodstuffs are well known; by the use of strongly ozonised air food can be kept indefinitely at 2° to 5° C., and for some time at 15° or even 18° C. Ozone stimulates plant life, and protects it against most parasites and diseases.

Fig. 50 shows a neat design of combined fan and ozone generator for domestic use, and attention may be called to the company's new apparatus for deriving a suitable alternating current when only D.C. supply is available. This apparatus replaces the ordinary converter hitherto used.

Holmquist Electric Co., Ltd. (225),

52, Regent Street, W.

This interesting exhibit demonstrates the ever-increasing application of electrical apparatus to medicinal ends. In fig. 51 we illustrate a semi-reclining electric-light bath which offers many advantages over Turkish and Russian baths. The cabinet is made in sections easily fitted together, and 40 incandescent lamps are arranged in the corners of the cabinet and under the plate-glass couch in such a manner that the entire body is subject to direct rays. The lamps are controlled by eight switches within the cabinet, but accessible from without through a small flap. A 16-lamp sitting cabinet is arranged on similar lines for home use, and various more elaborate equipments (some with arc projectors) are made for hospitals and professional establishments. Combined hot air and light baths are also made by this firm.

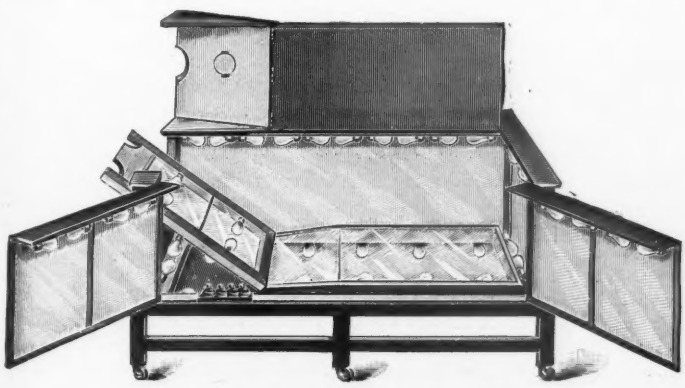


Fig. 51.—Holmquist Electric-Light Bath.

Since 1903 the company has made a speciality of electric vibrators, and one of the most popular models is illustrated in fig. 54. This is a three-stroke machine with seven applicators, and is driven by a ⅛-H.P. D.C. motor; if necessary the latter can be run from a battery of accumulators.

A representative selection of the hot-air douches, hot pads, medical coils and miscellaneous electro-medical accessories completes this exhibit. It should be remembered, however, that the Holmquist Co. also supplies the well-known "Therol" water-heaters and "accelerators" for the same.

Messrs. Eastman & Sons (Dyers and Cleaners), Ltd.; Messrs. Eastman & Warne (236),

241-243, Acton Vale, London, W.

A demonstration of electric ironing is given on this stand by Messrs. Eastman & Sons (Dyers and Cleaners), Ltd., who use electrically-heated irons in their own workrooms to give to dyed and cleaned work an excellent finish. The absolute cleanliness of these irons and their freedom from fumes or waste heat are matters of supreme concern in such a business. Messrs. Eastman find that the use of electricity for heating purposes ensures that the work turned out in the afternoon and at the end of the day is fully equal in quality to that done in the morning, and that—as the users work under the

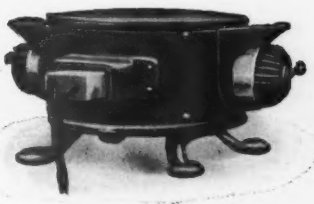


Fig. 52.—"Eadisk" Cooker.

Fig. 53.—"Hot-Point" Iron.

best possible conditions—more work is done by a given number of hands than when irons heated in any other way are employed. Some 300 electrically-heated irons are in constant use in the finishing departments of their works, and the cost of maintenance is negligible. Electric irons were first used by this firm in 1901, and were added to from time to time as improved types were available. The experience gained in repairing and rebuilding these irons has been put into the "Hot-Point" irons, which were developed by the engineering staff of Messrs. Eastman in an effort to procure the maximum economy in working, and, particularly, to keep the cost of maintenance at a low figure. This is secured by the use of plenty of heavy gauge wire wound on thin strips of mica, or similar material, embedded in a large number of slots in the back of the heating surface. The weight of wire used in these irons is considerably greater than in other types of iron. The 8-lb. laundry iron has 2,304 in. of wire so wound that over 80 sq. in. of heating surface are in close contact with the sole itself. Every unit of heat put into these irons is utilised for the work. No clamps or other heat-absorbing devices are used. The upper parts of the irons are designed for mechanical strength alone; they are well insulated from the soles, and remain cool. No heat is wasted here. The low stress on the wire ensures freedom from breakdown.

The success gained in Messrs. Eastman's factory has naturally led to inquiries for irons made in a similar manner and of the shapes and weights used for other trades. The officers of the Royal Army Clothing Department investigated the use of electricity for ironing, and after a prolonged trial of several leading makes, and various loadings, placed an order for the equipment of their factory at Pimlico with this firm. Some 25 distinct patterns of flat irons for laundries', tailors', blouse-makers', hatters' and domestic uses are exhibited at this stand. The method of suspending the cord for the irons working on this stand is worthy of notice.

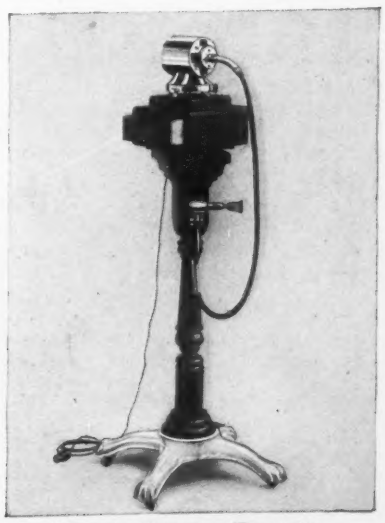


Fig. 54.—Electric Vibrator.

The "Eadisk" cookers shown by this firm (fig. 52) are a development of an electrically heated stove that was made to heat ordinary flat irons. In construction the heating elements take the form of what is practically a solid inlay at least 1 in. in thickness. The 7-in. disk has been run for prolonged periods with a loading of 1,250 watts without any sign of failure. The form of construction makes easy the provision of means of regulating the input of current and amount of heat generated. In the standard 7-in. cooker are two distinct circuits with switches controlling respectively 300 and 600 watts. The low heat is suitable for frying, the medium heat is suitable for general cooking and for heating flat irons, and both heats together are available for boiling water quickly. Any ordinary household utensils, preferably with flat bottoms, can be used on these cookers, which are made in several sizes, from 4¾ in. upwards. An 8-in. disk taking altogether 1,400 watts with seven regulated degrees of heat is made for use as an oven top. The regulation is attained with three ordinary switches, and no complication with series-parallel switches or plugs is entailed. This disk, of course, gets red hot if left in circuit with no useful work being done.

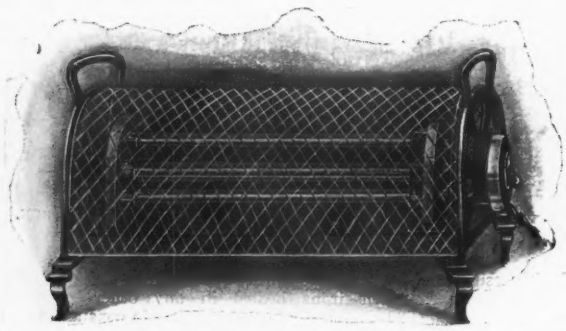


Fig. 55.—Bastian Patent "Quartzalite" Heater, A Type.

Branding-irons made in an exactly similar manner are also shown at this stand. The design is routed in relief from the heated surface, which is made of greater depth in these irons than in the cookers or flat irons. A number of these branders have been in use in various factories for a long time without sign of failure. Soldering-irons made on the same principle are shown in several sizes and patterns. A circulation heater for providing a supply of hot water during the months when the kitchen range or regular heater is not in use, is also shown here. The standard sizes of this heater take 6 to 9 kw., with provision for a switch for each kilowatt loading. If advisable, lower minimum windings can be provided and left in circuit as an all day load. The system of construction patented by Messrs. Eastman & Warne is applicable to hot plates of large dimensions and heavy loadings. A number of plates made under these patents are working with loadings of 6 kw. and 12 kw., under hydraulic pressures of as much as three tons per square inch.

The Bastian Electric Heating Syndicate, Ltd. (173, 190)

91-93, *Palmerston House, E.C.*

This company is showing practically all the various heating and cooking devices operated with the Bastian patent "glower," which, it may be remembered, consists of a quartz tube containing a spiral resistance wire, which is run at a full red heat, and is easily renewed when worn out. In fig. 55 we illustrate the A type, a small and compact device which is suitable for warming a ship's cabin, bathroom, &c. It is provided with a polished brass or iron frame, fitted with a wire guard and switch. Of the various other types of heater we select the "Medina" for illustration—so-called because heaters of this type have been installed in the Royal quarters on the P. and O. liner ss. *Medina*, in which our King and Queen will voyage to India in November. This is of the upright pattern, with a neat but handsome exterior (fig. 56). An "Exchange" type heater is shown in fig. 57, which can be substituted for the lamps used in lamp radiators, without alteration to the holders or wiring, and ovens, hot-plates, flat-irons, &c., are exhibited.

Fig. 58.—Calorite Iron on Stand.

Fig. 59.—Calorite Tea-Kettle.

The British Thomson-Houston Co., Ltd. (124, 135),

Rugby.

The chief feature of the B.T.-H. Co.'s exhibit is the well-known Mazda lamp; a complete range of these is shown, from 6 to 600 watts. This is, of course, a tungsten lamp. In this connection, special interest will centre on the new Mazda drawn-wire lamps, now shown, we believe, for the first time in this country. The filament, being made of tungsten wire, is naturally possessed of great strength and durability, and the opportunity of examining this type should not be missed. It is illustrated in fig. 61. Lamps for lighting trains, tramcars, ships, motor-cars, &c., are shown, as well as B.T.-H. Edison and Gem lamps, and the company has inaugurated a special engineering branch especially for laying out schemes for lighting of every description, and advising clients free of charge, which should enable the best results to be obtained. A special range of Holophane and Mazdalux metal reflectors is shown in conjunction with the lamps. A flashing sign at the exit of the Exhibition, 32 ft. long × 3 ft. 6 in. high, which is composed of nearly 3,000 Mazda lamps, and shows seven different changes of wording at 10-second intervals, is bound to claim the attention of the visitor.

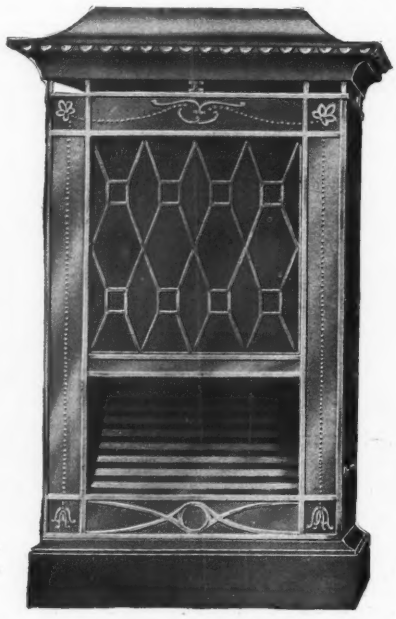


Fig. 56.—"Quartzalite" Radiator installed in ss. "Medina."

Fig. 57.—"Exchange" Heater.

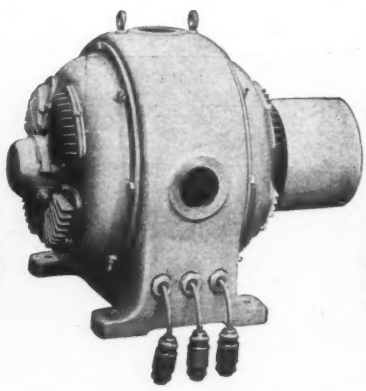


Fig. 60.—B.T.-H. Form K Enclosed Induction Motor, with Flange for Pipe Ventilation.

Fig. 61.—B.T.-H. "Mazda" Drawn-Wire Lamp.

Numerous motors made by the company are exhibited; of these we illustrate a form K induction motor with squirrel-cage rotor, enclosed ventilated with pipe connection (fig. 60). These motors are suitable for working under the most adverse conditions, for dust and damp are wholly excluded, and the pipe provides for the

introduction of clean dry air for ventilation. Polyphase and D.C. motors are also exhibited, as well as a variety of mercury meters and watt-hour meters, motor starting rheostats and switchgear. The cooking apparatus shown comprises kettles, percolators and hot-water jugs; we illustrate in fig. 59 the "Calorite" tea-kettle, which is made of polished copper, and takes 500 watts. The heating element consists of Calorite wire wound on a mica former, enclosed between two cast-iron plates, from which it is insulated by mica disks.

Fig. 58 shows the Calorite flat-iron, which has a similar heating element, closely applied to the sole of the iron, but insulated from the cover by an air jacket.

Finally, the Tirrill regulator, various transformers, arc lamps, circuit-breakers, fan motors and D.C. generators are shown—the whole forming an extremely comprehensive and interesting collection of apparatus.

Messrs. O. C. Hawkes, Ltd. (19, 42),

69 *and* 70, *Aldersgate Street, E.C.*

Electric signs form the most prominent item in this exhibit. Many descriptions are shown, including glass-fronted box signs of railway type, ornamental copper *repoussé* window illuminated signs, outside shop lanterns for advertising purposes, lamp letter signs with numerous switching and writing effects, showroom signs, illuminated facias, and illuminated stall boards. The resources of the firm's glass factory at Birmingham enable it to present

Fig. 62.—Hawkes Electric Sign.

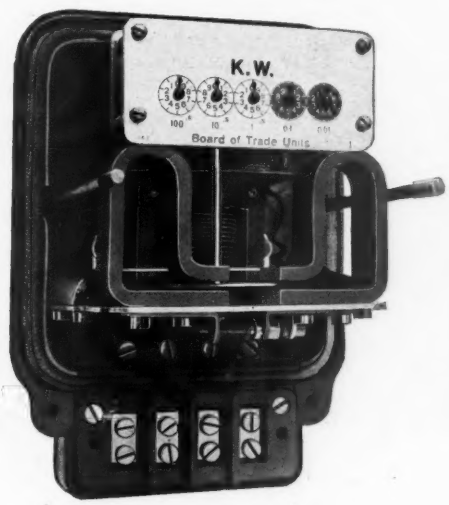


Fig. 63.—Bat Induction Meter.

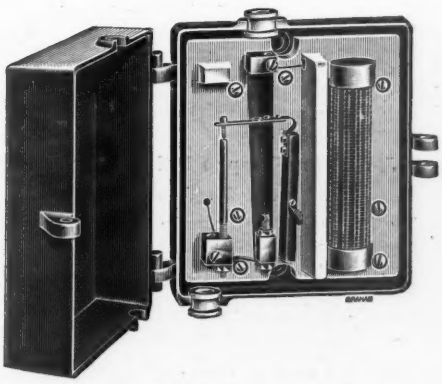


Fig. 64.—N.C.S. Thermal Limiter.

unlimited varieties of glass treatment, and some of the effects shown are novel and attractive. A sign for which economy in light distribution is especially claimed is the gold light letter sign, in which the letter itself is made of incised gilt copper, the light being transmitted through a concealed slot in the core of the lettering. A large facia sign of this type, worded with the name of the firm, is shown connected to a three-way motor switch showing the letters in three colours in rotation. The effect of this is excellent both by day and by night.

The crystalline glass patent is a process by which any artistic effect, even a landscape in full detail, can be reproduced faithfully on glass by specially trained artists. An example of this is seen in an illuminated picture of the Victoria Falls, on the Zambesi, as made for the British South African Co., showing the motion of the water in the Falls. This is a triumph of the glass craftsman's art.

The lamp letter signs are excellently made, every feature receiving special attention. The lampholders are practically weather proof, and at the same time accessible. One of the features of the exhibit is the artistic use of the Cooper-Hewitt lighting sign illumination, this being a line in which Messrs. O. C. Hawkes, Ltd., excel. Messrs. Hawkes, as our readers know, make a strong feature of electric stoves. Many styles of these stoves for heating rooms are shown, and practically every purse is provided for. Their patent induced-draught system of electric heating is employed, with its latest improvements giving easy interchangeability of elements with practically unlimited life. The advantages of the method of assembly is that purchasing firms can stock a design with the certainty of being able to render it available for any voltage at will. This is a new feature of this year's stove, and which, it may be, will encourage provincial buyers to stock for the winter.

The Hawkes patent electric cooking range is shown in practical use, the firm's qualified cook-demonstrator being employed in cooking and generally demonstrating the practical nature of the apparatus. The range can be put down in any kitchen to perform the work of any ordinary kitchen range. The firm also brings before the trade and the public a selection of electric Turkish baths, which are shown with every possible treatment that can be applied in the cabinet bath. The main feature of this bath is that it is designed for home use, and is being now installed in many private houses. It is not designed necessarily for invalids, although naturally used by them to a great extent, but is intended for daily use for healthy people.

Bat Meter Co., Ltd. (83),

3, *Eden Street, Hampstead, N.W.*

This stand contains a very comprehensive selection of electric meters, including prepayment, two-rate, single and polyphase meters, switchboard and tramcar meters. Among the standard types exhibited, special attention may be called to the A.C. watt-hour induction-meter, type "O" (illustrated in fig. 63); to the D.C. ampere-hour mercury meter, type "H"; and to the watt-hour meter, type "B," suitable either for A.C. or D.C. circuits. Compactness, lightness, strength, simplicity of design and facility for adjustment are the qualities aimed at throughout. The type "H" meter has a starting current less than $\frac{1}{200}$th of full load; less than $\frac{1}{10}$-volt pressure drop, and less than $\frac{1}{2}$ per cent. temperature error for 20° F. temperature variation. Meter "B" is exemplified by a 2,000-ampere instrument. The starting device, enabling accurate registration at $\frac{1}{500}$th full load, deserves special attention; a rocking device gives the brushes just sufficient motion to counteract their constant friction.

The current and potential transformers and the current limitors (the latter consisting of a cut-out with a trembler action, causing the lights on a circuit to flicker whenever and so long as a predetermined current limit is exceeded), are well worth careful notice

Messrs. Nalder Bros. & Thompson, Ltd. (86, 87),

34, *Queen Street, London, E.C.*

This firm is showing electrical measuring instruments on a large and complete scale, including those required for the measurement of current, pressure, power, power factor, frequency, &c. Exhibits which will be less familiar to most visitors are the N.C.S. thermal limiter and the Telethermometer. In the limiter

Fig. 65.—The Telethermometer.

the supply current is taken through a steel wire, which, by its thermal expansion, opens an auxiliary contact if the current exceeds a pre-arranged value. The opening of this contact places a resistance in series with the lamps, thus dimming them and reducing the main current flow. The steel wire then contracts sufficiently to reclose the dimming contact, after which the above cycle is repeated. This flickering goes on until the current demanded falls below the limit for which the instrument is set. The Telethermometer enables the determination, at a convenient central spot, of the temperature existing at any place which, for any reason, is difficult or impossible of access; it is thus applicable to cold storage chambers, tanks of liquid, hospital wards and so on. The instrument is built on the Wheatstone Bridge principle: three "arms" are wound with a

wire of practically zero temperature coefficient, while the fourth or variable arm is a coil of copper or nickel wire wound on a former and hermetically sealed in a metal tube. The latter arm is placed at the point, the temperature of which is to be determined. An indicating or recording instrument, calibrated in °C or °F, is used in the "galvanometer arm." This equipment constitutes a great advance on earlier systems of electrical thermometry.

Messrs. Johnson & Phillips, Ltd. (126, 133),

Victoria Works, Charlton.

These stands are illuminated by two circuits of "Metroflam" D.C. and A.C. flame arcs and two "Orb" enclosed D.C. lamps. The "Metroflam" lamps run four in series on 220 volts, and the "Orb" lamps, two in series on the same pressure (A.C. supply is at 50 cycles). The "Metroflam" lamp (figs. 67 and 68) is primarily intended for street, railway and dock lighting installations. The lamp burns about 80 hours per trim, and there are no dark intervals as the carbons change; cheap carbons and the absence of wastage when re-trimming contribute to the low running costs attained. The patent diffusing globe employed is very efficacious and remains unsoiled in use. Differential and shunt coils regulate the D.C. lamp, and, in the A.C. pattern, an induction motor feed is employed. Under contracts with the Croydon and Glasgow Corporations, and the G.C.R. Immingham Docks, nearly 500 of these lamps have been supplied. The standard "Orb" lamp has a single series regulating coil, and is a simple and reliable single and enclosed type lamp; the provision of a synchronous regulator renders it impossible for lamps burning in series to get "out of balance." The "Orb" lamp is supplied for D.C. or A.C. circuits, and is said to compare favourably with metallic-filament lamps; special patterns are made for factory and yard lighting and differential regulation is provided where required.

The cable exhibits include specimens of Messrs. Johnson and Phillips's V.I.R.; paper-insulated, lead-covered; and vulcanised bitumen cables, all of which are too well known to need any detailed mention.

A standard 10-KW. motor-generator set represents the firm's activities in this direction. At 1,000 R.P.M. the generator output is 100 amperes at 100 volts. The construction of this machine is thoroughly representative of modern practice, and a special feature is the provision of self-lubricating ball bearings, needing attention only once in 12 months.

Those interested in searchlights should certainly inspect the fine 24-in. 80-ampere marine projector exhibited. The lamp is,

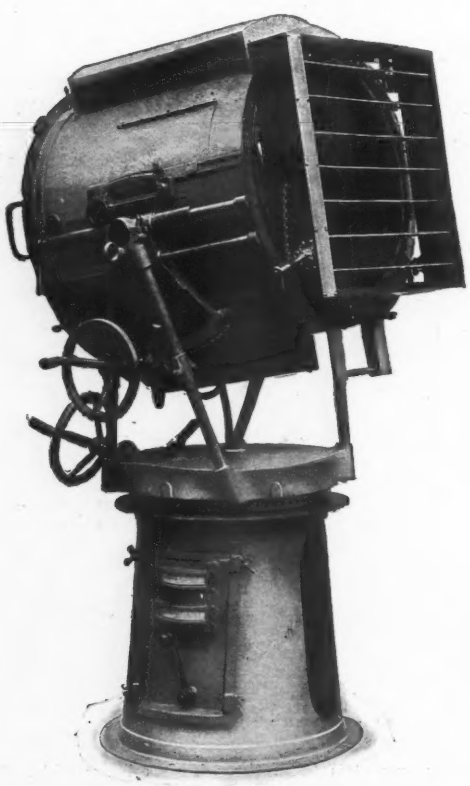


FIG. 66.—SEARCHLIGHT PROJECTOR, MARINE TYPE, BY JOHNSON & PHILLIPS, LTD.

as usual, arranged for hand or automatic working, and every provision is made for the convenient, rapid and accurate manipulation of the whole equipment and the resulting beam. Special attention is paid to the balancing and smooth working of the moving parts, and a venetian flashing shutter fitting over the front glass enables the lamp to be used for signalling. During the Exhibition this lamp will be supplied with current from the motor-generator noted above.

The switchgear exhibits cover practically the whole ground of modern English construction, and include—(1) A standard operating panel and glazed brick cubicle containing a complete remote control equipment for use on 10,000-volt three-phase systems. Oil switchgear is employed, and all the usual measuring instruments and safety and indicating devices are included. (2) A standard 3,000-volt "back of board" type of panel, complying with the latest Home Office Regulations, and suitable for use in central

FIG. 67.—"METROFLAM" FLAME LAMP, EXTERIOR.

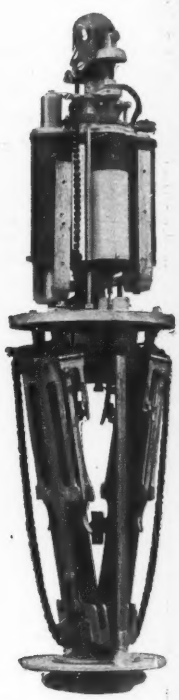


FIG. 68.—"METROFLAM" FLAME LAMP, INTERIOR.

station and private plants. These units are very easy of extension, and the whole of the equipment is of Messrs. Johnson & Phillips's standard manufacture. (3) A two-panel low-tension board. One of the panels is a standard 600-ampere tramway feeder panel, the other controls the various D.C. and A.C. circuits on the stand.

In the temporary sub-station supplying current to the Exhibition two boards have been loaned to control the 2,000-volt two-phase supply, and to distribute 220-volt three-phase current to the various supply mains.

Among the smaller exhibits may be noted an assortment of switches and fuses, and fuse and distributing-boards, besides an accumulator-board for country-house and similar installations, and typical service-box, straight-through (colliery) box and crane plugs. A graphite powder limiting resistance for use in connection with horn type lightning arresters presents novel features of construction.

Jandus Arc Lamp and Electric Co., Ltd. (105, 110),

Hartham Road, Holloway, N.

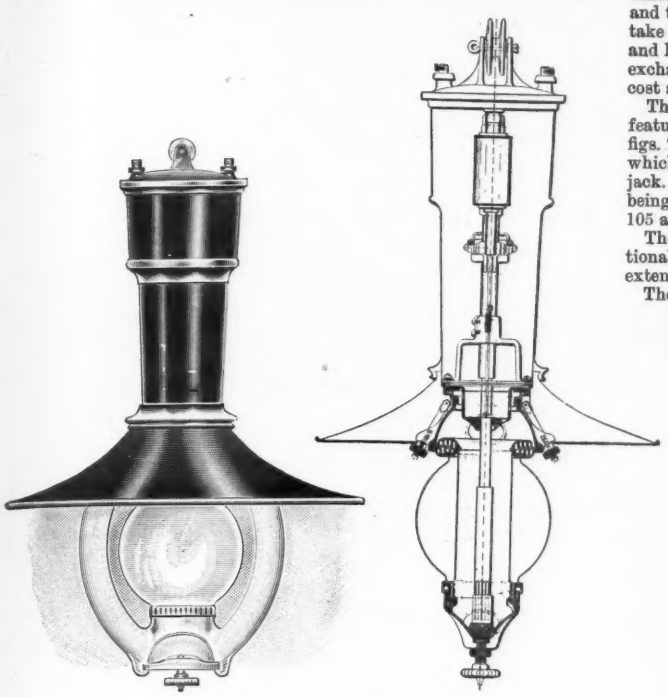
The Jandus patent regenerative flame arc lamp, the fame of which is now world-wide, operates upon a unique principle, viz., the combustion of chemically treated carbons in an air-tight enclosure. The accompanying illustrations (figs. 69 and 70) show the external and sectional appearance of the lamp. The lower framework consists essentially of two metal tubes carrying the inner cylindrical and outer spherical globes. The heated gases from the arc rise to the top of the inner globe and are returned to the bottom of the latter through the external tubes; the gases then re-ascend past the arc and this circulation is continuously maintained. As a result of the enclosure and the regenerative principle, the carbons burn very slowly, one pair lasting 70—120 hours, according to the particular adjustment of any one or series of lamps. Only one pair of vertical carbons is used per trim, and the carbons are mechanically strong and capable of withstanding rough handling.

With a current consumption of only 5 amperes, 4,000 C.P. is emitted in a direction 15° below the horizontal (a most valuable distribution for lighting streets and open spaces). The light possesses valuable fog and mist penetrating qualities and the overall efficiency is nearly 8 C.P. per watt (0·125 W./C.P.). The arc can be adjusted to suit voltages between very wide limits.

Constructionally the lamp is simple and strong; the top carbon having a vertical feed, there is no necessity for any clockwork mechanism. Such mechanism as is necessary is well finished and of substantial design.

The small-consumption regenerative lamp (yielding 1,800—2,000 C.P. at 15° below horizontal, with a consumption of only 250

watts, including line resistance loss), enables enormous economies in current, carbon and labour charges. As compared with the ordinary single-enclosure arc lamp and metallic-filament lamps, the small Jandus lamp shows double the candle-power for half the consumption, and 10 times the candle-power for the same consumption in the respective cases.



Figs. 69 and 70.—Exterior and Sectional Views of the Jandus Arc Lamp.

Visitors to the Exhibition will be afforded special facilities for inspecting the actual manufacture of the regenerative lamp at Holloway.

Western Electric Co., Ltd. (51, 72),

Norfolk House, Victoria Embankment, W.C.

This firm, pioneers in the introduction and development of the central-battery telephone system, are exhibiting telephones and switchboards for small and large central-battery equipments and for magneto-ringing systems. Telephones for residences, hotels and public buildings are shown in operation, and instruments for traction, mining and military purposes are on view. The exhibits also include specimens of lighting power, telegraph and telephone cables, cable laying supplies, fibre conduits, insulating materials, weld-clad copper wire, fuses and metallic-filament lamps. A special display of the improved Blue-bell dry cell for bell and telephone work has been arranged. Special attention may be called to the No. 4,010 Western Electric central-battery multiple switchboard with lamp signalling installed for the G.P.O. as a local exchange in the building and placed in full view of the public; also to various central battery switchboards suitable for use in private exchanges and to a table switchboard, arranged for office use, in which keys take the place of cords. Telephone systems with magneto ringing and local speaking battery are very reliable for private use and for exchanges of moderate size; their simplicity and low maintenance cost are greatly in their favour.

The No. 1,200 magneto-switchboard (fig. 73) has many unique features, among others the combined signal and jack shown in figs. 71 and 72. On operation, the signal displays a red "eyeball," which is restored automatically by the insertion of the plug in the jack. The jack is immediately below each signal, rapid working being thus facilitated. The board illustrated is a 60-line unit; 105 and 210-line capacities are also provided.

The No. 1,800 unit type magneto board is so arranged that additional units can be added as the requirements of the exchange extend, with no further outlay than that of the units required.

The new hexiphone arm may be fixed to either wall or desk. A tubular support carrying transmitter, receiver and switchboard is an integral part of a metal arm 40 in. long, which may be swung in any direction right out of the way, but which is instantly to hand when required.

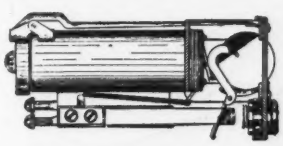


Fig. 71.—W.E. "Eyeball" Signal Operated.

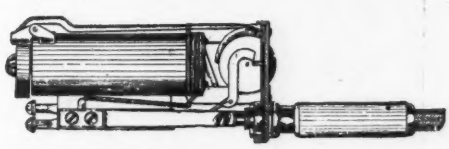


Fig. 72.—Signal Restored.

The "Interphone" illustrated herewith (fig. 74) may be arranged for metallic circuit, common return or central-battery operation on from 5 to 20 lines. Greatly improved button selectors enable the instant and accurate selection of the line desired. The sets are made for wall or desk use, and either may be changed to the other in a few minutes.

The type 40,028 all-metal interphone (up to 12 lines capacity) is intended for installation during the building or redecoration of any building. The back half of the set contains only a terminal strip sunk flush with the wall; the connecting cable is sunk in the wall and connected to the strip. When the building is complete the front half of the set is simply screwed to the back; the case then projects only 1 in. from the wall (see fig. 75). The selector buttons give the ring when pressed right home; when released, the speaking circuit is closed till the next call automatically restores the button. A central battery is employed and a modified pattern is arranged for desk use.

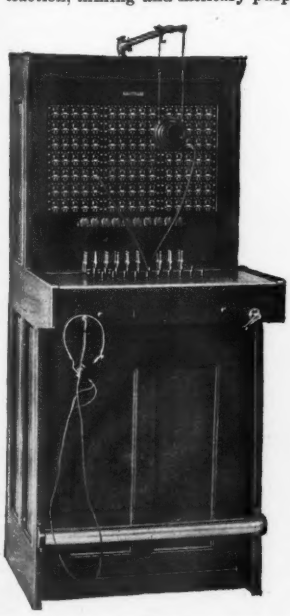


Fig. 73.—Magneto Switchboard.

Fig. 574.—Western Electric Interphone.

Fig. 75.—All-Metal Interphone.

A new farmers' line set is simple to install and exactly meets the facilities lately granted by the P.M.G. The powerful five-magnet generator provided will ring the equivalent of 40 2,500-ohm ringers on a 30-mile metallic circuit of No. 12 B.W.G. iron wire.

In concluding this brief review of a most interesting exhibit, we must note a pocket battery tester (measuring only 3 in. × 2 in. × 3 in. and weighing 4 oz.) and an instrument protector, having a self-soldering heat coil, which can be operated and used over again several times. Through the centre of the coil is soldered a pin with a cogged wheel at the end. A strong spring is hooked to the wheel, and when the coil is operated the solder melts, the pin turns and the spring flies off the cog and breaks circuit.

Foster Engineering Co., Ltd. (194, 221),

Morden Road, Wimbledon, S.W.

The well-known B.E. arc lamp of the Foster Co. is strongly in evidence at this stand. This lamp, burning equally well on A.C. or D.C., singly on 100-120 volts or two in series on 200-250 volts, yields 1,000 C.P. for a current consumption of 5 amperes. One pair

FIG. 76.—FOSTER SWITCH. (COVER REMOVED, SHOWING INTERIOR. OPERATING KEY IN POSITION.)

of carbons lasts 80-100 hours, or in the smaller size 40-60 hours. Messrs. Whiteley's new premises in Bayswater are lighted by over 350 B.E. lamps. Other well-known types are the photo-arc and the "Q" lamp made by this firm; the "Q" downward-feed lamp has a remarkably low carbon consumption. For some time past the Foster Co. have been paying special attention to the design and manufacture of every class of power, lighting and miniature transformer. The examples shown in this department are most creditable, and the portable oil-cooled testing transformer (giving pressures from 200 to 30,000 volts) will doubtless interest mining, central station and cable engineers.

The safety automatic switch and plug illustrated herewith (figs. 76, 77, 78) is intended for use in such dangerous situations as powder magazines, spirit works, &c. The switch is placed outside

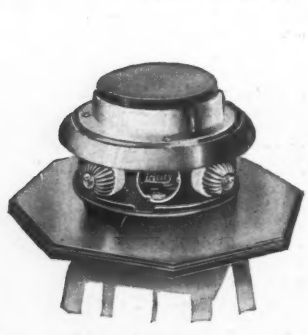


FIG. 79.—"TRICITY" SINGLE COOKER.

and the plug and socket together with a portable lead are within the danger zone. The plug cannot be withdrawn while current is flowing, and the switch is automatically opened should a lamp break or a "short" occur. The whole equipment is mechanically strong and perfectly gas and water-tight.

Consumers on A.C. supply will realise some of the advantages at their disposal on inspecting the Foster auto-transformers for lighting circuits, the efficient "dimming" switch (employing a choking coil), and the Foster alternating current bell, dispensing entirely with battery power. The Foster metallic-filament lamp is supplied for every class of lighting, and reliable tests have shown that after 1,000 hours' burning the lamps give more than their original candle-power, and this with a lower power expenditure per candle-power.

H. C. Slingsby (171),

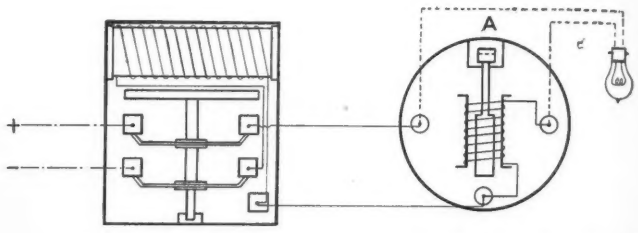
Old Street, E.C.

Mr. Slingsby is again showing a number of his patent trucks and ladders, a selection of about 60 from 1,000 varieties made by him being exhibited. The Slingsby manufactures include patent sliding wheel trucks, "Collron" sack trucks, hand carts, portable and permanent railway material, carrier tricycles, wheelbarrows, platform trucks, castors, roller and ball bearings, steelback patent extension ladders and steelheld extension step-ladders.

L. Hervé (278),

90, *Clerkenwell Road, E.C.*

This exhibit consists of a showcase of samples of all kinds of screws, terminals, stampings and turned-metal parts for the electrical trade. The firm's manufactures are of considerable variety, and large stocks of screws and terminals are kept. Special turned



SWITCH (KEY OMITTED). SOCKET AND PLUG.

A, Locking-bolt preventing withdrawal of plug when current is flowing

FIG. 77.

FIG. 78.—PLUG AND SOCKET.

or stamped parts are made to order in all kinds of metal, also in ebonite and fibre.

The Berry Construction Co., Ltd. (30, 31, 312),

29A, *Charing Cross Road, London, W.C*

A full range of the "Tricity" cookers and utensils manufactured by the company is shown at this stand, comprising a duplex cooker, single cooker, extension cooker, large and small ovens, coffee and hot water

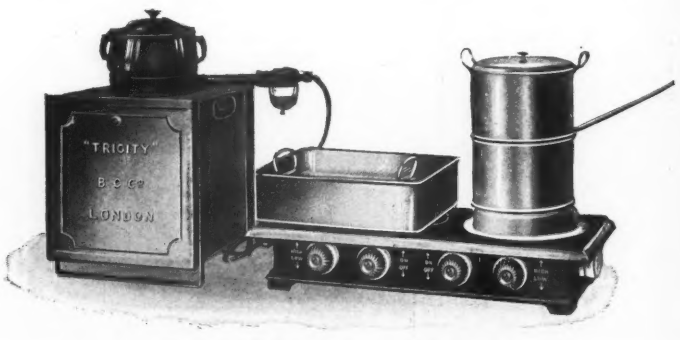


FIG. 80.—"TRICITY" KITCHEN RANGE.

urns, grills, flat irons, saucepans, steamers and the special chinaware utensils which the firm have introduced. Fig. 79 shows a single cooker, and fig. 80 a complete kitchen range. Noteworthy features of the "Tricity" system are the extreme flexibility of the apparatus, which enables the same heating elements to be used for the various culinary operations, and the consequent saving in energy; the absolute cleanliness of the whole apparatus, the lightness of the oven, which can be brought on to the kitchen table to be scoured, and the bright polished surfaces of the oven, which are most essential to get the highest possible efficiency. The great saving in the weight of joints cooked in the "Tricity" oven, by lessening the shrinkage while roasting, has been pointed out in our pages. Frequent demonstrations are given at Stand No. 119D in the gallery, as well as in the main hall.

Callender's Cable and Construction Co., Ltd. (196, 219),
Hamilton House, Victoria Embankment, E.C.

Messrs. Callender's exhibit consists principally of assortments of various types of electrical underground junction boxes, which the firm has been making in great variety for a long time past. This portion of the stand contains samples of feeder pillars, both lighting

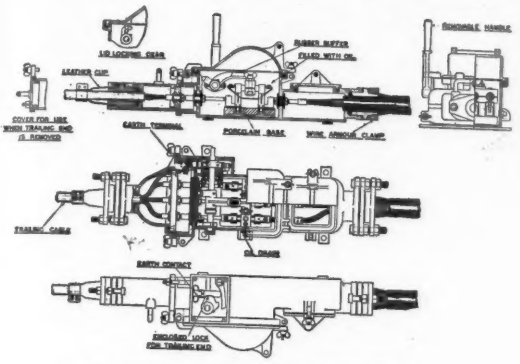


FIG. 81.—CALLENDER GATE-END BOX.

and traction, underground network boxes and mining boxes, as well as ordinary service and house fuse boxes.

Fig. 81 illustrates a gate-end box, designed for use in supplying and controlling electrical energy to coal cutters. The provisions

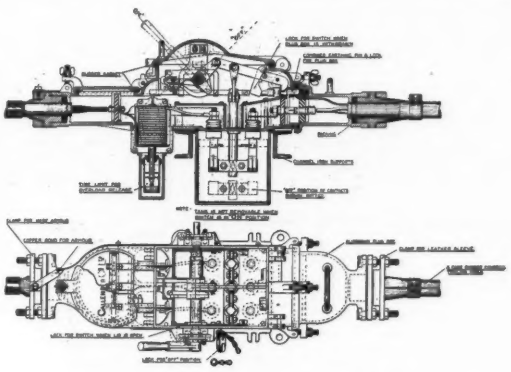


FIG. 82.—GATE-END CIRCUIT-BREAKER.

made for bonding the various parts and hermetically sealing the box should be specially noted. The whole of the contacts are oil-immersed when in use, and the switch lid cannot be opened or the trailing cable plug removed till the switch is in the "off" position,

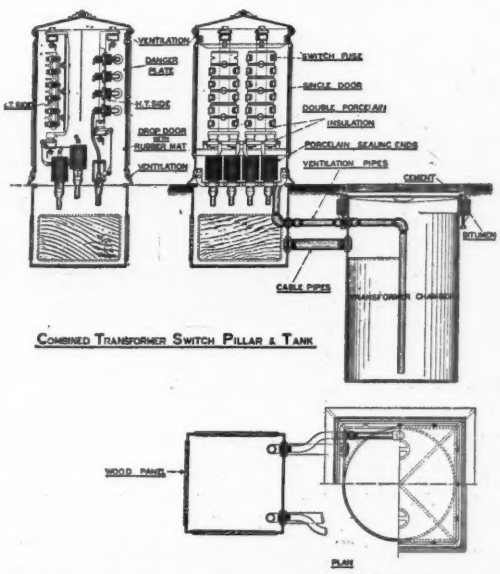


FIG. 83.—HIGH AND LOW-PRESSURE SWITCH PILLAR.

nor, when the door is open or the plug removed, can the switch be closed. Absolute security of operation is thus secured. A special design of gate-end circuit-breaker (fig. 82) with oil-immersed gravity break should claim the attention of all mining engineers. The trip coil switch can be adjusted to cover a wide range of time limits, and the general construction of the whole is such as to enable easy inspection and repair while absolutely avoiding any possibility of sparking in the open.

A standard cable drum, for the supply of three-phase power to pumps, drills, &c., in sinking shafts, is made for pressures from 600 volts to 3,000 volts, with band brakes and winch or worm feed according to the weight of cable handled. Supply is taken to the inner end of the cable *via* enclosed slip rings on the axle, and sinkings 900 ft. in depth may be thus supplied. For the supply of current to the various levels of a mine from the main shaft cables, the three-way network boxes exhibited, of the Callender mushroom porcelain design, are specially convenient and reliable.

The combined high and low-pressure switch pillar illustrated in fig. 83 forms, in conjunction with the underground transformer tank, a small transforming and distributing station, which should be particularly interesting to engineers in charge of scattered A.C. supply areas. This equipment is far cheaper and more suitable for the development of electric supply in outlying districts, than the more or less elaborate sub-stations hitherto usual. The transformer chamber is protected by a footpath cover and inner lid forming a waterproof combination. Adequate ventilation is carefully provided, and the separation, insulation and general arrangements of the high and low-pressure switchgear are clearly shown.

Another feature of this exhibit is the alloy section. The firm took up the manufacture of alloys some years ago, and have already established a considerable reputation in this connection. Being themselves, by virtue of their electrical business, large users of the metals from which the alloys are manufactured, they are able to offer alloys of all qualities at low prices. This part of their exhibit consists principally of bronzes and anti-friction white metals.

They are also taking advantage of the present opportunity to bring their Kalbitum paint, for use with ironwork for preventing rust and corrosion, more directly to the notice of the public.

Kalanite, also shown, is an insulating material of high quality which can be moulded or turned into any shape, and can also be supplied in sheet or rod form.

For some time past Messrs. Callender's Co. have been manufacturing the "Fors" accumulator for Messrs. Richard Pape, Ltd., and a further section of the stand is given up to an exhibit of these accumulators.

Messrs. Duncan Watson & Co. (60, 63),
62, *Berners Street, London, W.*

The principal feature of this exhibit is an electric vacuum cleaner—a line for which the firm has now become fairly well known. The machine takes from 150 to 200 watts, runs on ball-bearing castors, and is suitable for residences of any size. The cleaner is shown in operation, and suitable illustrated booklets are, of course, available for the visitor. There is also shown a complete electric lighting plant with oil engine, dynamo, switchboard, and section of storage battery. The plant is shown running, and particulars are given in an illustrated leaflet as to the cost of plants from 1½ H.P. upwards. The stand itself was designed and

FIG. 84.—DUNCAN WATSON VACUUM CLEANER.

built at the firm's own works in Marylebone, and consists of two pillars supporting a handsome and substantial signboard, on the top of which, fixed on a pedestal, is to be found one of the vacuum cleaners slowly revolving on a ball-bearing platform, driven by a small electric motor. On the signboard the name of Duncan Watson & Co. is written in small lamps. The decorations are in white and gold. In the centre of the stand an electric fountain plays continually. The stand is outlined with substantial brass pillars, while within the pillars rows of flowers in pots fixed in metal trays give a charming finish. Cartoons are shown of a country house lighted electrically, and also of a maid using the vacuum cleaner.

Messrs. Vickers, Ltd. (235, 241, 310),

River Don Works, Sheffield.

The exhibit prepared by the electrical department of this well-known firm consists of a 300-KW. Vickers rotary converter, six-phase, 50 cycles, running at 750 R.P.M., giving 220 volts on the D.C. side and 160 volts on the A.C. side, complete with starting

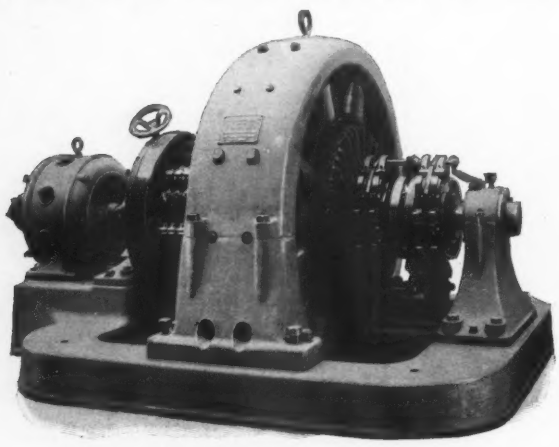


FIG. 85.—VICKERS 300-KW. ROTARY CONVERTER.

motor and switchgear. A similar machine is illustrated in fig. 85. The rotary can be seen at work, in a sub-station at the Exhibition. It is controlled by a three-panel switchboard made by Messrs. Ferranti, Ltd., and current is supplied to it by means of a transformer wound for 160 volts six-phase, to 650 volts three-phase. The transformer was made by the British Electric Transformer Co., Ltd.

In addition to the foregoing rotary converter, Messrs. Vickers are showing an imposing collection of various types of electrical machinery, switchgear and lighting, cooking and heating apparatus. A complete range of "Vickers" D.C. motors is on view, ranging from ¼ H.P. to 50 H.P. output and of various types according to duty. The makers report an exceptional demand for these machines, and further extensions of their manufacturing accommodation are already contemplated. The motors are characterised by their clean build and cool running. Commutating poles are fitted to all machines subject to reversal or heavy overload, and the fine adjustment provided on the box type brushes is worth special notice. According to requirements, the motors are "protected," "totally enclosed" or "watertight." The company now exhibits its first batch of A.C. squirrel-cage and wound rotor motors, made for all standard voltages, and any output up to 25 H.P. From the excellence of their mechanical and electrical design and construction, these machines deserve as wide popularity as the D.C. patterns.

A two-panel switchboard provides for the control of a 10-KW. A.C.-D.C. motor-generator supplying the various motors on the stand through three feeder cables. This board is a typical example of Messrs. Vickers's switchboard construction.

The Vickers centrifugal fans are largely employed in the Royal Navy and in mines, power houses and factories all over the world. The special scoop-shape of the blades reduces air-slip to a minimum, and results in very high efficiency. The propeller type fans are intended for exhausting steam, acid fumes, foul air, &c., from workshops and factories. All fans are supplied for every variety of electric drive.

Among the motor starters exhibited may be noted the standard open, enclosed and watertight patterns with no-voltage and (if required) overload releases. These have iron-wire resistances wound on porcelain bobbins; up to 15 H.P., button contacts are fitted, but above this capacity renewable contacts are employed. The overload release can be set at any limit between full and 100 per cent. overload. The "Autograd" type of starters is specially applicable to industrial work, being self-accelerating. The operator simply moves a handle carrying a pot magnet to the left; the magnet then grips an armature on the contact maker, and the whole is drawn across the contacts by a coiled spring beneath the face plate. An oil dash-pot provides for exact control and regulation of the starting up.

A wide variety of motor-control panels and pillars is on view. The Vickers control pillar comprises a double-pole overload and no-voltage circuit breaker, a drum-type starter, a shunt regulator for variable-speed motors, resistances for starter and shunt regulator and D.P. switch fuses. The pillar is designed to replace the ordinary motor-control panel in those cases where service is exceptionally severe; it is specially recommended for the control of motors driving printing and calendaring machines, machine tools, &c. If necessary the pillar can be operated in conjunction with push buttons at various points for normal or emergency control.

The standard Vickers controllers, for cranes, machine tools, printing presses and so on, have a deservedly high reputation for reliability and simple, cheap maintenance. The Vickers crane panel is of specially compact design; a 50-ampere 4-motor panel measures only 10 in. × 20 in. × 9 in. The positive and negative live parts are kept entirely apart, "Fireite" fuse-bases and partitions are used, and pilot and inspection lamps are provided; when required, ammeters are fitted to the panels. The Electric and Ordnance Co. will show a typical crane cage fully equipped with the "Vickers" crane panel and controllers.

Among the many other classes of switchgear exhibited may be noted the "Vickers" ironclad combined quick-break lever switch and fuses, specially recommended for house service and general industrial motor work (made in six sizes up to 400 amperes and for 250 and 500 volts, and in double and triple-pole types). A 15-ampere 500-volt quick-break switch (6¾ in. × 5½ in. × 5¾ in.) has been developed for house service and exterior arc lighting work. This switch is combined with wire fuses, and is completely weatherproof. The "Vickers" Star Delta switches are applicable to three-phase squirrel-cage induction motors up to 100 H.P. (starting against light loads), and are made in three types, viz., oil-immersed, with overload and no-voltage releases; oil-immersed, with no automatic releases; protected type completely enclosed in cast-iron case. The switches are of metal and mica throughout, and enable the complete isolation of motors from the mains. The automatic gear protects against every possible contingency, and the whole equipment meets the Home Office and Mines Regulations. A special type of lock-on-and-off switch is exhibited, in which a quick make and break is secured, and the blade "locked" by means of steel balls. The company's new line of knife switches is specially designed for efficient working and easy renewals of the flicker blade.

During the past seven years the Electric and Ordnance Co. have had considerable experience in the construction of electric heating and cooking apparatus, and the "Eclipse" devices exhibited will, doubtless, secure many converts to electric heating and cooking. The timid should be reassured by the four years' guarantee given on convectors, and the one year's guarantee on all other

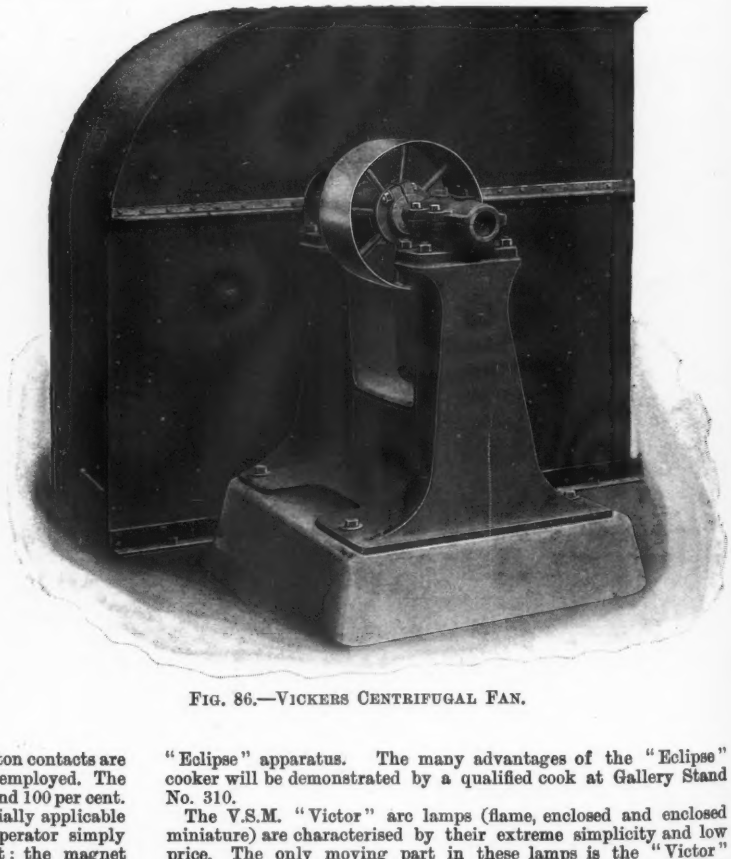


FIG. 86.—VICKERS CENTRIFUGAL FAN.

"Eclipse" apparatus. The many advantages of the "Eclipse" cooker will be demonstrated by a qualified cook at Gallery Stand No. 310.

The V.S.M. "Victor" arc lamps (flame, enclosed and enclosed miniature) are characterised by their extreme simplicity and low price. The only moving part in these lamps is the "Victor" patent magnetic clutch. Large numbers of these lamps are giving entire satisfaction in iron and steel works, among other applications. The lighting exhibit is completed by a complete range of the "V.S.M." incandescent lamps (colloid-tungsten and carbon types), and porcelain lighting accessories.

Interesting samples and examples of the application of the company's insulating material "Fireite" and aluminium alloy "Duralumin" will be on view during the Exhibition, and, in con-

clusion, we may call attention to the "Timken" adjustable roller bearings, taking radial or axial loads, and built for loads ranging from 270 lb. to 1,935 lb.

Messrs. Bruce Peebles, Ltd. (119, 140),

Edinburgh.

This exhibit includes a very representative selection of the various types of motors and converters manufactured by this well-known firm. The 500-KW. motor-converter (built under the La Cour patents), is an excellent example of modern design. This set occupies very small floor space, is specially stable when in synchronism, and has a full load efficiency of 92 per cent. The machine exhibited (fig. 88) is designed to feed a lighting and power system at 450-550 volts D.C. when supplied at 6,000-6,600 volts, 50 cycles three-phase; 16 similar sets are now being supplied to the Calcutta Electric Supply Corporation, Ltd.

FIG. 87.—PEEBLES LOOM MOTOR.

The split-pole converter exhibited represents a type of machine designed to convert D.C. from a higher to a lower voltage in a single machine. The split-pole converter can be designed for any ratio of transformation between the limits 10 : 1 and 1 : 1, and has at all times 5 to 12 per cent. higher efficiency than a motor-generator of similar output. The machine may have shunt or compound characteristics as desired, and can be made to raise the pressure of D.C. if required. The applications of the converter include the supply of constant-current arc circuits, and variable-speed motors, driving, say, paper-making machines; it may also be used as a balancer or to effect a double voltage reduction.

The A.C. exhibits include a standard 10-B.H.P. squirrel-cage induction motor, conforming to the rules of the Fire Offices Committee for textile mills; a 10-B.H.P. slip-ring motor, fitted with short-circuiting and brush-lifting gear, and provided with an air-gap adjusting arrangement; and a 20-B.H.P., with automatic centrifugal starter, designed to yield a high starting torque with relatively small starting current. The Peebles loom motor (fig. 87) gives ½ B.H.P. at 765 R.P.M., on a three-phase, 40-cycle, 230-volt circuit. The machine is of the totally-enclosed squirrel-cage type, and has ball bearings and a flexible suspension, enabling very smooth driving. This motor is recommended for the vertical, horizontal, or inclined individual driving of looms and similar machinery.

The special brush gear designed for motors used on haulage and other severe work deserves special attention, as also does the three-phase 100-H.P. semi-enclosed liquid starter.

Lack of space prevents more than passing notice of the protected, semi-enclosed and totally-enclosed motors, the crane or capstan motor and the mining and traction motors which represent Messrs. Bruce Peebles' direct-current manufactures.

Messrs. Mirrlees, Bickerton & Day, Ltd. (8),

Hazel Grove, near Stockport.

The "Mirrlees-Diesel" oil engine shown by this firm is a four-cylinder, 160-B.H.P. engine, and is a duplicate of a considerable number of engines the company has made for driving dynamos on board warships, most of the recent British battleships and first-class cruisers being fitted with these engines. It is of the completely enclosed type with forced lubrication to all bearings, and is direct connected to a dynamo. Four separate oil supply tanks containing different grades of oil are connected with the engine in such a manner that the engine can be switched over from one grade of oil to another whilst running, the object of this arrangement being to demonstrate that no alterations are necessary to enable the engine to work with widely varying qualities of oil. The dynamo is connected with a water resistance, and suitable switches are provided, so that full load or partial loads can be switched on and off as desired. Thus visitors will have an opportunity of noting the behaviour of the plant with widely varying loads. The engine is compact and occupies little space.

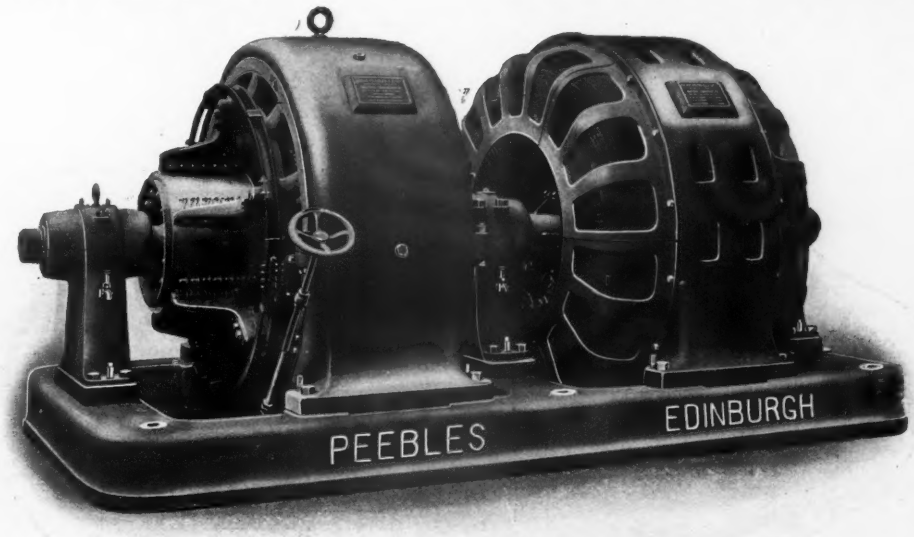


FIG. 88.—MOTOR-CONVERTER OF 500 KW.

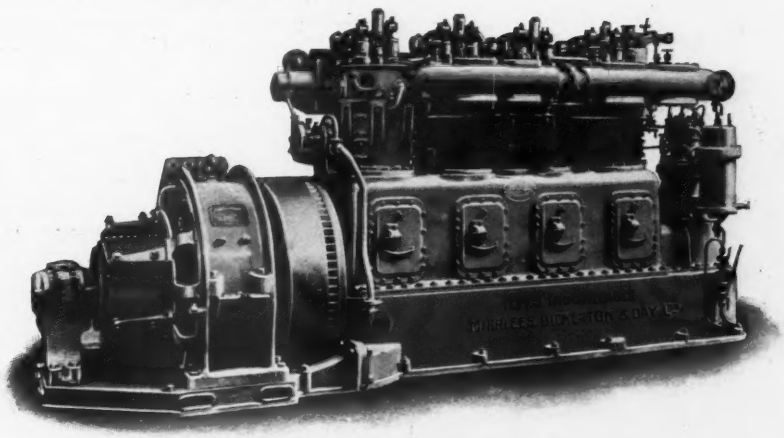


FIG. 89.—MIRRLEES-DIESEL 160-B.H.P. OIL ENGINE.

Messrs. Hans Renold, Ltd. (250),

Progress Works, Brook Street, Manchester.

Steel driving chains and wheels for the transmission of power are, of course, the keynote of this exhibit; silent chains suitable for speeds up to 1,300 ft. per minute, and powers up to 300 H.P.; roller chains for medium and slow speed driving, and block chains for slow speed driving and conveyor work are shown. An interesting item is a silent chain running at about 1,000 ft. per minute,

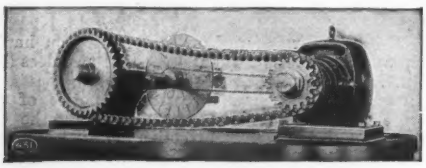


Fig. 90.—The Rotoscope as used for observing the Working of a Renold Chain.

with a rotoscope attached, by means of which visitors can see, while the chain is in motion, how the links mesh with the wheel teeth. How this is arranged is shown in the accompanying figure.

The Renold chains are so admirably adapted for use with electric motors—giving a silent positive drive, while affording great latitude in choice of position of the motor—that electrical engineers should not fail to take note of them. They are used in many textile mills driven by electric motors, and may pass through the floor to motors fixed to the ceiling of the room below, thus removing the objection sometimes raised to electric driving that more floor space is required.

The Westminster Engineering Co., Ltd. (165),

This company is showing its new enclosed flame arc lamp for street lighting, docks, railway stations, &c.: the lamp is fitted with carbons for long burning, and the fumes from the burning carbons are carried off by means of a system of circulating ducts contained in a chamber at the top of the globe. An equalising tube is fitted connecting this chamber with the bottom of the lamp, in order to prevent any rise of pressure in the chamber, and to maintain the circulation of the gases.

The firm's well-known types of enclosed lighting and photographic arc lamps, fitted with shades or reflectors to suit different requirements, are also exhibited, as well as an enclosed pattern lamp made

Fig. 91.—"Westminster" Marine Pattern Single Enclosed Arc Lamp.

Fig. 92.—"Toplight" Photographic Arc Lamp.

specially strong and portable for ship use, with self-contained resistance and protected globe—so arranged that the lamp can be stowed away without damage or stood upon deck without hurting the globe. We give an illustration of this lamp (fig. 91), and of the "Toplight" photographic arc lamp (fig. 92). This is a powerful lamp specially made for portraiture and for use in low studios; by having the glass at the top instead of the bottom of the lamp, some 2 ft. is gained, which is of the greatest importance in studios 9 ft. or 10 ft. high.

The small hand-feed enclosed 2½ to 4½-ampere lamp, shown in fig. 93, has met with the greatest success for enlarging lanterns and small projection work; the positive carbon is horizontal, and is fed forward as required; on a 200-volt circuit, however, it will burn for three-quarters of an hour without touching. The positive crater

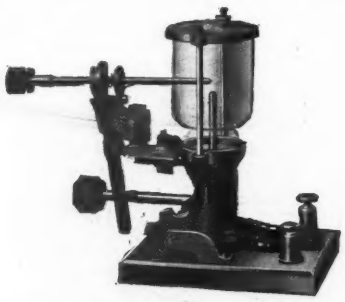


Fig. 93.—"Westminster" Semi-automatic Arc Lamp.

is directly in line with the centre of the lens, providing the brilliant point of light required for this work. A larger pattern lamp of the same type is also exhibited. In quite a different line, the Westminster electric fresh-air heater is shown; this is provided with air inlets from the outer air, and the incoming air is warmed in passing over the heating elements before passing into the room,

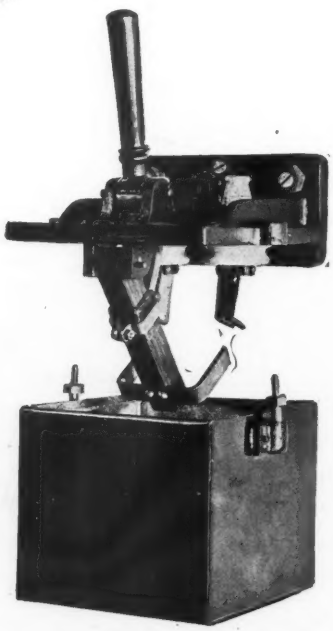


Fig. 94.—Partridge High-pressure Oil-break Switch.

thus heating and ventilating the room at the same time. The "Partridge" safety device for transformers, and the "Partridge" high-pressure oil-break switch for 2,000/3,000 volts, 20/15 amperes, for house or transformer service, are other features of the exhibit; the latter is a simple and substantial device, as will be seen from fig. 94.

The British Aluminium Co., Ltd. (266),

109, *Queen Victoria Street, E.C.*

Aluminium in various forms, as used in the electrical industry, is exhibited by this company. Aluminium is now extensively used for almost all classes of conductors where formerly copper alone could be economically employed. One of the largest fields for aluminium is in bare cables for overhead transmission lines, and the company is exhibiting samples of these cables for currents from 2 to 2,000 amperes, as well as all the jointing and other material. Aluminium in bar and rod form is also now extensively employed for all kinds of switchboard and central-station connections, and the company is exhibiting a complete switchboard panel with aluminium connections. The exhibit, further, includes examples of all the different forms in which the metal is supplied, together with a collection of electrical fittings and apparatus in which aluminium plays an important part. A very interesting feature of the stand is the bare aluminium coil as used for tramway motors, alongside of the equivalent copper coil, showing the large saving in dead weight of the former, together with better cooling. The exhibit also includes a number of samples of insulated aluminium cables of various types, as supplied by the company.

Phœnix Dynamo Manufacturing Co., Ltd. (59, 64),

Thornbury Works, Bradford.

In the exhibit of this company is included a 300-B.H.P. 3,000-volt induction motor, of the slip-ring type, running at a speed of 485 R.P.M. As this is for use in haulages underground, the slip rings and all bare contacts are enclosed in flame-proof boxes, fitted

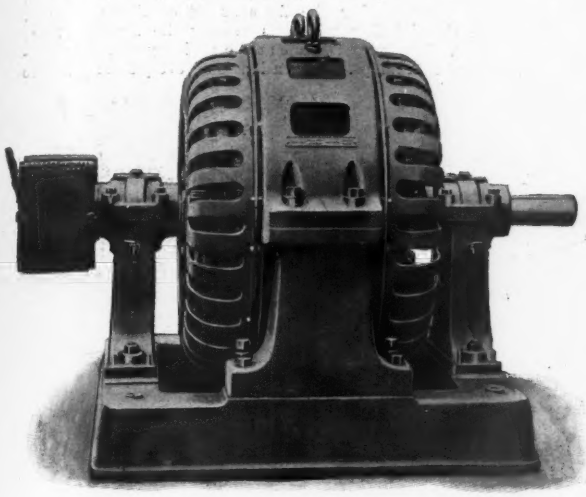


Fig. 95.—Phœnix 300-h.p. 3,000-volt Explosion-Proof Mining Motor.

with the "Phœnix" patent explosion-proof gland. The rotor is provided with slip-rings and short-circuiting and brush-lifting gear. Special precautions are taken with this class of machine to prevent any possibility of moisture affecting the insulation, and in the whole of the construction no unimpregnated material is used, mica being the principal ingredient. The machine is illustrated in fig. 95. An explosion-proof "Phœnix" patent mining motor of 35 B.H.P. at 500 volts is also shown, which can be run with safety in a fiery atmosphere. Another exhibit of considerable interest and novelty is the "Phœnix" patent plating dynamo, in the armature of which a patent return conductor is employed. By

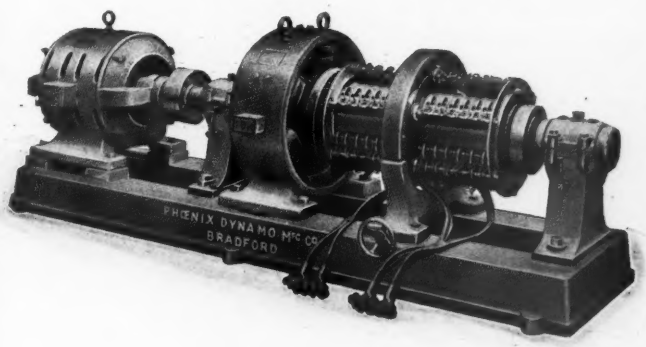


Fig. 96.—Phœnix Patent Plating Dynamo.

means of this device, the reactance voltage of the machine is reduced to about one-half of the ordinary reactance voltage. As it is the reactance voltage which is primarily responsible for the commutation troubles which afflict heavy-current dynamos, resulting in rapid wear of the commutator, and a still more speedy wearing away of the brushes, this invention, as applied to this particular class of machine, affords an effective solution of the heavy-current problem. Several large machines of this type are running in various parts of England and abroad, and it is hoped that it will be possible to have a 2,000-ampere machine running at 50 per cent. overload on the stand to demonstrate the immunity from sparking which is possible with this type of machine. Our illustration, fig. 96, shows the machine as exhibited, driven by a motor.

The remaining exhibits include a "Phœnix" patent self-regulating plunger pump—a small device driven by a "Phœnix" electric motor and controlling gear, as used in country houses and similar installations, and designed to avoid the necessity of keeping huge storage tanks in the roofs of country houses and factories; the pump is coupled directly to the water pipes, and the switchgear is set for a certain definite water pressure. Immediately any of the taps connected with the mains are opened, and the pressure is reduced, the motor automatically starts and runs until the specified pressure is again reached.

A patent electric sensitive drill and an electric grinding machine with emery disk and grinding attachment are also shown.

The Concordia Electric Wire Co., Ltd. (270),

Crown Parade, Cricklewood Lane, London, N.W.

This firm is exhibiting as its special lines the following:—H.C. copper wires and high-resistance wires in all dimensions from one mil upwards; cotton-covered magnet wires, enamelled copper wires, bare resistance wires, strips and sheets of various grades and for all purposes, having specific resistances from 18 up to 96 microhms per cu. cm.; and patent "asbestin" copper wires, round or square section, insulated with pure asbestos, the thickness of which is no heavier than that of an ordinary double cotton covering. This is specially recommended for traction motor work. Resistance wires covered in the same manner are also exhibited. Other manufactures shown include bare copper flexibles, asbestos-covered copper flexibles, charcoal iron wires, armature binding wires, fuse wires, rubber-insulated flexible cords, wires and cables for all purposes, telephone cords and cordage, insulating tapes and materials of all descriptions and for all applications, and ready-wound magnet coils of various designs.

Messrs. Laing, Wharton, Ltd. (56, 67),

7, Great Newport Street, W.C.

Messrs. Laing, Wharton are the sole British agents for Messrs. Vedovelli, Priestley & Co., of Paris, some of whose switchgear we recently illustrated; and at their stand they show a great variety of that firm's apparatus, including numerous patterns of switches for high and low-pressures, indoor and outdoor, circuit-breakers, remote-controlled switches, relays, fuses and lightning arresters. Of these we illustrate in fig. 97 the "Carter N.B." type, similar to the type which has been exclusively adopted for the French Navy; it is made for currents up to 8,000 amperes at 750 volts single-pole

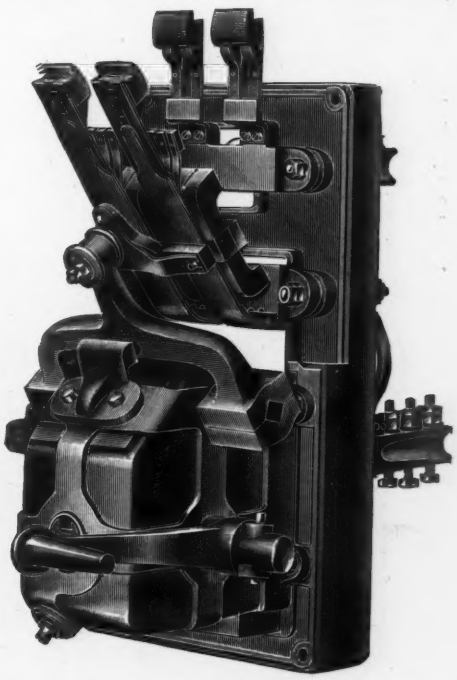


Fig. 97.—"Carter N.B." Circuit-Breaker.

or 3,000 amperes triple-pole, and is provided with carbon sparking pieces and free handle; in closing the switch, the hand moves downwards away from the contacts, and it is opened by means of a button at the bottom of the casing. A reverse-current no-volt release is provided if desired, in addition to or substitution for the overload release. A 100,000-volt transformer will be installed at the stand early next month.

Messrs. Drake & Gorham, Ltd. (61, 62),

66, Victoria Street, London, S.W.

This exhibit includes the following: The Frisby patent mechanical ammeter, for measuring the current passing in cables from the outside, also the Frisby patent current detector for detecting the presence and direction of current in conductors; and the Drake and Gorham magnetic clutch for shop driving, especially applicable for planing machines where a reverse motion is required. The firm are wholesale agents for quartz heating apparatus (Bastian patents) and Price's heaters for greenhouses, motor garages, &c., and in addition to these lines they also exhibit Holophane glassware, vacuum cleaners, a selection of decorative fittings in various periods, arc lamps, and general accessories.

J. Ciceri Smith (239),

32, Theobald's Road, E.C.

Direct-reading micrometer caliper gauges constitute this exhibit; the inventor has, as will be seen, improved the micrometer gauge by providing it with dials upon which the measurement can be read at once, without any of those tedious and error-introducing computations that are generally necessary. How clear is the reading is well shown by the woodcut, fig. 98, which represents a gauge reading by $\frac{1}{1000}$ in. up to $\frac{1}{4}$ in. The dials are actuated by a train of wheels geared to the micrometer spindle; the pitch of the

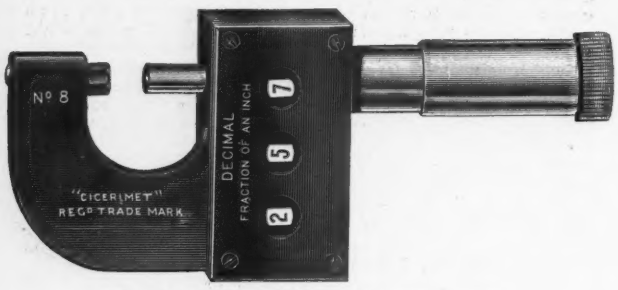


Fig. 98.—Direct-reading Caliper Gauge

screw is $\frac{1}{50}$ in., and the screw thread is protected by a sleeve. The knurled head drives the spindle through a slipping friction device, which prevents any possible injury to the screw, and ensures uniformity of pressure in measurements. The instrument is made in a variety of patterns embodying these principles in inches and millimetres; the dials save time and eyesight, besides preventing mistakes, and can be read by anyone without the preliminary instruction and practice required in the case of the older types.

The Linolite Co. (143),

25, Victoria Street, Westminster.

The Linolite Co. are showing the most recent improvements in Tubolite, their patented system of electric lighting, and its numerous applications. The economy of Tubolite, which has always been one of its characteristics, has now been largely increased by the introduction of metal-filament Tubolite lamps, which are made for 25 and 100 to 125 volts, and are run in series on higher voltages. On account of the special design of the reflector, the consumption of power by metal-filament "Tubolite" is less that 1 watt per candle-power of useful light.

Over 25 miles of Tubolite have been sold, a unique record. Tubolite is especially suitable for shop window lighting, as the

Fig. 99.—Tubolite Table Lamp, Pattern D.

light can be directed where it is most required, and there is no waste of light in the direction of the street.

For use in the office or study Tubolite table lamps are shown in several patterns, to suit varying requirements, one of which we illustrate in fig. 99. These table and desk stands are made in bronzed or bright lacquered brass, fitted with a length of Tubolite, and are capable of adjustment to suit the needs of the moment. English lamps are used.

The Sunbeam Lamp Co., Ltd. (55, 68),

Gateshead-on-Tyne.

The company are showing a remarkable display of carbon and metal-filament lamps, of which they are one of the oldest manufacturers in the kingdom. Amongst the lamps shown is everything from the small miniature or battery lamp to the huge bulb of 1,000 c.p. It is of special interest to note the exhibit, for the first time in this country, of the wire-type tungsten lamps which the company are developing. These are claimed to be as strong as wire, the principal feature being the filament of continuous length, obviating all the jointing which is usually the feature of the tungsten lamp. The lamp is made at the ordinary efficiency associated with tungsten lamps. Carbon lamps of every description are

Fig. 100.—Sunbeam Lamp Bracket.

also exhibited, including the original Sunbeam heating or radiator lamp. The company were the first, in conjunction with the Dowsing Radiant Heat Co., to put this class of lamp on the market. A special display is given of the Lux candle lamp and fitting.

Sunbeam accessories of every description, and a selection of choice designs of fittings and original signs, an electrical device for calling vehicles from the stand, ironclad switches, power material, insulators and a motor-driven flasher for signs, are included in the comprehensive exhibit of this company, which is arranged in a striking manner, a huge globe of the world forming the office to which callers will be welcomed.

The London Decorative Metal Works, Ltd. (291),

44-46, Eagle Street, Holborn, London, W.C.

There is here to be seen an array of general metal work, including an attractive assortment of ornamental electrical accessories, notably switch and plug plates, dome covers and bell pushes. At

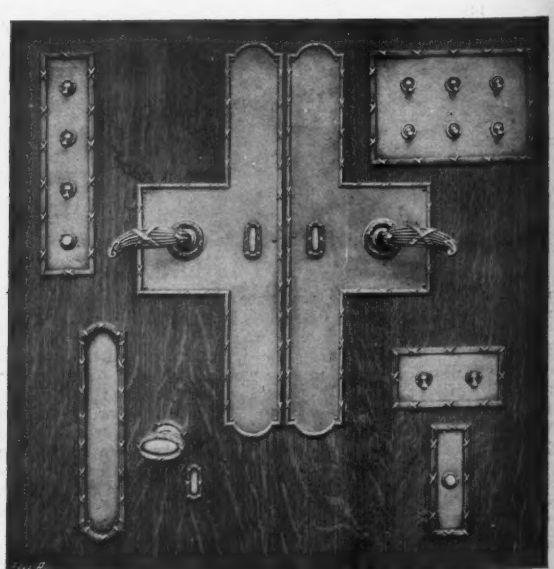


Fig. 101.—Show Panel in Louis XVI Style.

first sight switch covers would not appear to be an important item in an electric light installation, but it must not be forgotten that the switch top and switch plate are the only parts of the wiring

installation that are at all times visible, and a little care and foresight in the choice of these apparently small accessories count for more in the eyes of the public than the highest perfection in technical excellence invisible to the ordinary layman. The decorative styles mostly favoured by the London Decorative Metal Works are the classic French and early English. Among the latter some handsome multiway Georgian plates, finished in a soft antique silver, will attract attention. The accompanying illustration, which will give a good idea of the class of work made by this firm, is that of a show panel fitted with a Louis XVI suite, in which the decoration is severely confined to the favourite reed and ribbon border. For the information of contractors, it may be said that in all the designs shown, complete suites of interior metal fittings, such as door furniture, lock plates, cabinet fittings, sash lifts, table trestles, and so forth, are to be had in keeping with switch plates and domes. The effect of a good installation must be enormously enhanced when its accessories harmonise with the other decorative features of the room.

TRAMWAY and RAILWAY NOTES.

(*Continued from page* 504.)

Continental Notes.—DENMARK.—Since the tramways of the Copenhagen Tramway Co. were taken over by the municipality, the employés of the two private tramway companies—Frederiksberg Elektriske Sporvijs Selskab and Tuborg Klampenborg Elektriske Sporvijs Selskab—have been on strike. As already mentioned in these pages, a proposal to raise the wages of the staff was laid before the Town Council, and this proposal was afterwards agreed upon. The object of the strike was to get the men of the two private companies put on the same wages as their municipal *confrères*. At the beginning of the strike the companies were willing to meet the strikers by offering 6 per cent. increase in the salaries, but this offer was unanimously rejected by the men. Now the companies have engaged quite a new staff, and by means of these and some of the old employés who have broken loose from their trade unions, the system is being operated as usual. The result is that the men will never regain their old employments, and the companies have got a cheaper staff, as the newly-engaged people have to begin with smaller salaries. But, nevertheless, the old functionaries are still "striking"!—*Tekn. Tidsskr.*

RUSSIA.—The municipal authorities at Archangel are negotiating for the conclusion of a loan of 1,000,000 roubles (about £105,000), the proceeds of which are to be applied to the construction of an electric tramway, the lighting of the town with electricity, and the construction of market halls.—*Board of Trade Journal.*

A new section of the electric tramways in Odessa has just been completed and opened for traffic. There are now 12 miles of electric tramways at work in the city.

AUSTRIA-HUNGARY.—The Allgemeine Oesterreichisch Ungarische Gasgesellschaft has purchased the Mödling gasworks for £100,000, and has made an offer to the communal authorities to set up in Mödling an electric generating plant for lighting and power purposes, also to construct an electric tramway either direct to Vienna or to Wiener Neudorf to join the Vienna-Baden line. The communal authorities have appointed a committee to consider the matter. A railless electric system is to be built from Müglitz through the northern Moravian towns of Meedl, Neustadt, Aussee, and Mürau.

A syndicate has been formed, under the presidency of Privy Councillor Gyula v. Szájbely, of Budapest, for carrying out a project of the engineers L. Fischer-Rainau (Zürich), Anton v. Steller, and Prof. Dr. Moritz v. Hoor-Tempis (Budapest), for the establishment of hydro-electric works on the Danube, near Pressburg, with a capacity of 70,000 H.P.—*Board of Trade Journal.*

The movement for the extension of electric railways in Austria-Hungary shows no abatement, although in some cases temporary intermissions have taken place. The great main line from Innsbruch to Munich through the Scharnitz and Mittenwald mountains was last winter stopped altogether, owing to the impossibility of laying the concrete work during frosty weather; but the smaller tunnels between Innsbruch and Seefeld have all been pierced, save the Schlossbachgraten and the Martinswand. The last-named has been driven for more than 500 metres on the east side towards Innsbruch and for some distance on the west side. The bridge over the Inn at Hötting is already under construction. The contractors for the line, Messrs. Kuhl, of Innsbruch, have just received the sanction of the Ministry for Railways for an electric standard gauge line from Rovereto to Riva on Lake Garda. The importance of this connection for the foreign traffic of South Tyrol and Lake Garda is obvious. The projected construction of a hanging railway up the Plose near Brixen (South Tyrol) is assured. From Brixen, 560 m. above sea-level, the line rises, in three stages, to a height of 2,470 m., and is not only the highest but the longest mountain line in the Tyrol. The journey will take 46 minutes, and the cost of the undertaking is estimated at 1·3 million kr.

Further schemes have been sanctioned as follows: The building of an electric railway from Gloggnitz (Lower Austria) to Semmering, *viâ* Schottwien and Mariachultz; a narrow electric line from Bad-Ischl to Weissenbach, on Lake Atter; also a line from Lake Atter to Vöcklamarkt, 14 km. long, the promoters being the Gemeinde of St. Georgen, in the Attergau; and a line from Reichenberg, in Bohemia, to the foot of the Jeschkenberg, near Reichenberg. Finally, the building of an electric tramway at Przemysl, in Galicia, and an electric railway from Zarnbek to Altbiela are among the new projects. On the electric express line from Vienna to Baden there has been for some time under trial an electric motor wagon equipped with a patented spring arrangement whereby a saving of 38 per cent. in power is stated to be achieved.—*Elektrotechnische Zeitschrift.*

Negotiations are already under way for the enlargement of the project to extend the Tatra suburban electric network to Barlangilet. It is now proposed to continue the line to Liso, on the Hungarian border, and thence on to Zakopane on Austrian territory.

SWEDEN.—The preparatory works are, says *Affarsvärlden*, being actively prosecuted for the introduction of electric traction on Swedish railways. The first to be completed will be the line from Gellivare to the Swedish-Norwegian frontier; this is the leading iron ore exporting line, its terminus on the coast being Narvik in Norway. The second electric line will be from Stockholm to Saltsjöbad, a fashionable seaside resort. The company owning this railway has just contracted a loan of 2 million kr. to cover the cost of electric conversion. The third line is very likely to be that from Goteborg.

GERMANY.—A long discussion took place at a meeting of the Berlin City Council on September 21st in regard to the proposed electric railway between Gesundbrunnen and Rixdorf, which has been under consideration for several years. The line would have a total length of 5·89 miles, and is estimated by the A.E.G. to involve an expenditure of £4,200,000, mainly as an elevated railway. By a large majority the City Council has now rejected the scheme as a high-level railway, and has requested the magistrate to enter into fresh negotiations with the A.E.G. with a view to the construction of the line solely as an underground railway. It is stated, however, that the company is not prepared to make any further concessions in the matter.

The Siemens-Schuckert Co., of Berlin, is reported to have secured the contract for the construction and equipment of a system of electric tramways in the town of Marburg (Hessen-Nassau).

ITALY.—Official permission has been granted to the T.C. of Padua to construct and work an electric railway from Padua to Abano.

SPAIN.—Reuter says that the Bilbao tramway service was partially resumed on 15th inst. in spite of the opposition of the strikers, who had to be dispersed by troops.

The Sociedad Anonima Iberia Concessionaria of Bilbao has secured the concession for the construction and working of an electric tramway from Porrino to Vigo.—*Elektron.*

A new electric tramway which is being built by the Compania de los Ferrocarilles Vascongades between San Sebastian and the French frontier, *via* Loyola and Irun, is approaching completion.

The first section of the new electric tramway between San Sebastian and Tolosa has lately been completed and opened for traffic.

FRANCE.—A new company has lately been formed at Dunkirk, with a capital of £24,000, and the title La Société Nouvelle des Tramway Electriques de Dunkerque to acquire and carry on the electric tramways in the town.

Dudley.—An alarming accident, fortunately unattended by any serious consequence, occurred on Saturday afternoon. A Stourbridge car was going down Castle Hill, a steep declivity when owing, it is stated, to the dampness of the rails and the failure of the supply of sand, the brakes failed to act, and the driver was unable to pull up. The car, going at a fair speed, struck a Birmingham car, which it pushed into the depôt, smashing the upper part of the doorway. A horse and parcels' cart were involved in the accident, the cart being smashed to atoms, and the horse so much injured that it had to be slaughtered where it fell in the shafts. One passenger in the Birmingham car and two in the Stourbridge car, were slightly injured, but although taken to the Guest Hospital, they were not detained. Other passengers suffered from shock, but they soon recovered; a parcels' messenger, standing in the depôt at the time, was also a little hurt. The drivers and conductors of the cars apparently did their best under the circumstances and stuck to their posts while it was possible to do so. The failure of the brake power seems inexplicable. The rails were, however, very greasy with the rain, and the Stourbridge car appears to have skidded along the metals, the incline increasing the momentum as it proceeded. The B. of T. will probably hold an inquiry.

Glasgow.—The Tramway Committee has agreed to continue consideration of the proposal which raised much adverse criticism—to run a new line of tramways from South Portland Street to Sauchiehall Street *via* Buchanan Street and a new bridge over the river. At its last meeting the Committee was asked to review its conclusions and report again. The object the Committee had in view in making the proposals was to relieve the congestion of traffic generally over Glasgow Bridge, and it has now decided to hear a deputation from the Gorbals Ward Committee, which is to ask that alternative cars from certain of the southern districts should be diverted so as to cross Stockwell Bridge, where the traffic is normal.

It is recommended by the T.C. Committee that the Tramways Department should again make the annual contribution of £500 to be divided between the Royal, the Western and the Victoria Infirmaries.

At the last meeting of the T.C. it was reported that a sum of £470 had been paid for the provision of food, &c., for the police on duty during the recent tramway strike. The account was passed by the Council, it being pointed out the expense was incurred under common law, and that the sanction of any particular item was unnecessary.

Halifax.—At a special meeting of the Corporation Tramways Committee last week, it was decided to ask Mr. W. M. Rogerson to devote the whole of his time to the management of the electricity works on account of the increasing demand for electricity and possible development in the works, and to relinquish the post of tramways manager. It was resolved to place the management of the tramways in the hands of Mr. Caird and Mr. Galloway, two of the present chief tramway officials. It was also decided to discuss with the Highways Committee the question of transferring the work of maintenance of the tramway track to a special department of the Corporation.

Hayti.—Concessions have been granted (1) for the construction of a railway, 140 miles long, from Leogane to Cayes, including various branch lines, and (2) for the erection of hydro-electric works designed to supply electric power to the railway which runs from Port-au-Prince to Piéton-Town, a distance of 5 miles, and to the Port-au-Prince tramways, which have a length of 11 miles.—*Board of Trade Journal.*

Irlam.—Renewed efforts are to be put forth by influential ratepayers in Irlam to induce the Salford Corporation to extend its tramways from Peel Green to Irlam and Cadishead, which are developing into populous industrial districts.

Liverpool.—The Tramways and Electric Power and Lighting Committee has decided to recommend the City Council to grant one week's extra pay to all the employés in the general manager's department (including the salaried staff) who were in the service at the time of the strike in Liverpool and who remained loyal, and to the members of the salaried staffs in the resident electrical engineer's department who were employed on emergency work.

Newcastle-on-Tyne.—Whilst the North-Eastern Railway Co. have for some years past been operating their passenger traffic over the suburban lines in the Tyneside area almost entirely by electric power, the goods and mineral traffic has been conducted by steam power, with the single exception of the short incline leading up from the quay side, Newcastle, where two B.T.H. locomotives are in regular use. We understand, however, on the authority of a usually well-informed correspondent, that during recent months not only the question of working the goods and mineral traffic between Newcastle, Shields and Tynemouth, by electric power, but also the adoption of electric shunting engines in the marshalling yards at Heaton and elsewhere in the Tyneside district has been under consideration, and that, in connection with this subject, Mr. Vincent L. Raven, the company's chief mechanical engineer, has recently left for America, where he will inspect various types of locomotives in actual service on some of the American lines for the operation of freight traffic. Mr. Raven is accompanied by Mr. Charles H. Merz, of Newcastle-upon-Tyne, who is the consulting electrical engineer to the North-Eastern Railway, and was responsible for the electrification of the Tyneside branches.

Norwich.—The T.C. has abandoned the proposed purchase of the undertaking of the Electric Tramways Co.

Southend-on-Sea.—The T.C. has received the sanction of the L.G.B. to a loan of £1,261 for the improvement of the tramway at the shore end of the pier.

West Hartlepool.—With reference to the negotiations between the Corporation and the Tramway Co., the Corporation has proposed that the company shall lease the Park and Foggy Furze routes which the former has bought, and also a section of the Hartlepools system lying within West Hartlepool, which the Corporation proposes to buy, together with the two miles extension which the Corporation meditates making, the terms of the lease to be: The company to pay 5 per cent. per annum on Corporation capital expenditure, the company to establish a sinking fund and contribute £150 per route-mile per annum for the maintenance of the tramways, and the company also to pay a rental. The Tramway Co. reply that, calculating on past results, such an agreement would involve them in a heavy annual loss, and they regard the proposal as absurd. They offer to sell to the Corporation the remainder of the tramway system in the borough, or to lease the same on more favourable terms than the Corporation proposes to them. Alternatively they offer to accept tenure of 42 years of all running powers on terms previously submitted. Here the matter rests for the present.

TELEGRAPH and TELEPHONE NOTES.

Austria.—Great activity prevails at the present time in Vienna and throughout Lower Austria in connection with the extension of the telephone system. The whole area of the capital city is being equipped with telephone lines and exchanges at suitable intervals, and the work will extend well into next year Besides the main scheme, a series of block systems will be set up. Outside Vienna and throughout the length and breadth of Lower Austria the improvement of existing installations and erection of new ones is in full swing. In some 30 towns, telephone services will be established for the first time, while in 16 others new installations are already under way, and partly completed. The public call for telephone conveniences is indeed so extensive and widespread that it already exceeds the funds available for such works. Next year's Budget will have to provide a credit many million kronen in excess of that allotted last year to telephone construction purposes, without, however, fully satisfying the great public demand. As a consequence of the cable-laying operations in progress in Vienna, Lower Austria and the several Crown lands, valuable orders for material are being placed by the Post and Telegraph Administration. The cable manufacturers are especially affected, and several of them, and notably the firm of Felten & Guilleaume, have asked for time indulgence on the completion of contracts. The telephone apparatus industry, which had previously been suffering under a period of stagnation, has received the welcome fillip of some 6 million kronen of orders for telephone station equipment, and others may be expected to follow their completion, Austria having great leeway to make up in the matter of telephone conveniences, as is shown by the fact that in 10 years the telephone network has only increased from 9,046 km. to 11,000 km.—*Der Elektrotechniker.*

The L. M. Ericsson Telephone Manufacturing Co., which lately founded an affiliated company in France, has now concluded negotiations to form similar companies in Austria and Hungary, with the assistance of Swedish, Austrian and Hungarian banks.—*Affärsvärlden.*

Sweden.—It is reported from Stockholm that it has been possible by means of the newly-introduced Murray system to send 2,000 messages to Gothenburg a day. In view of Norwegian and Danish competition, the Swedish Board of Telegraphs proposes to reduce the coast fee for wireless telegraphy at Gothenburg from 4d. to 1½d. per word, as the range of this station has proved to be only 1,200 km. instead of the calculated 3,500 km.

Wireless Telegraphy.—The wireless station which has been erected on the roof of the "G.P.O. West" consists of two masts, which are 50 ft. high and stand about 240 ft. apart, supporting a system of bare copper wires forming the antenna; the rest of the apparatus is fixed in the laboratory of the G.P.O. engineering department. The installation will allow experimental work to be carried out with greater facility and at less expense than heretofore, and will enable new devices which inventors submit to the Postmaster-General from time to time to be placed under closer observation than formerly, and to be tested under practical conditions.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Western Australia.—October 18th. 20 coin-in-the-slot attachments for the P.M.G. See "Official Notices" August 25th.

November 21st.—One automatic or semi-automatic switchboard and equipment, for the P.M.G.'s Department. See "Official Notices" September 15th.

South Australia.—October 25th. Cable and paper sleeves for the P.M.G. See "Official Notices" September 1st.

New South Wales.—October 30th. Five turbo-alternators of 5,000 kw. each, for the New South Wales Government Railways. Full particulars from Electrical Engineer's office, 61, Hunter Street, Sydney. This contract was advertised in the *Sydney Telegraph* of July 29th, and the matter is referred to fully in our "Tramway Notes" of September 15th.

Queensland.—November 8th. Deputy P.M.G. Switchboards, measuring instruments and protectors, telegraph instruments, switchboard parts and accessories, telephone instruments. High Commissioner in London, 72, Victoria Street, S.W.

South Australia.—November 1st. 5,000 insulators, porcelain No. 8, for the P.M.G.'s Department. See "Official Notices" September 22nd.

New South Wales.—December 20th. One branching multiple magneto switchboard at Broken Hill, for the P.M.G.'s Department. See "Official Notices" September 22nd.

South Australia.—November 15th. Deputy P.M.G. Telephone cords and earpieces, seven magneto switchboards, three milammeters, six relays and oneset of Wheatstone fast-speed duplex repeaters, 10 tons of hard-drawn copper wire, and one electro-motor.

Victoria.—October 3rd. 8,000 yd. of 3-in. fibre conduit, for the Melbourne City Council. See "Official Notices" to-day.

Queensland.—November 8th. Ironwork, measuring instruments and protectors, switchboards, switchboard parts and accessories, telegraph and telephone instruments, for the P.M.G.'s Department. See "Official Notices" to-day.

November 22nd.—Cable for the P.M.G.'s Department. See "Official Notices" to-day.

South Australia.—November 15th. Telephone cords and earpieces, for the P.M.G.'s Department. See "Official Notices" to-day.

Belfast.—October 9th. 2,000-ampere switchboard apparatus, and field regulating rheostat and change-over switch, for the Corporation. See "Official Notices" to-day.

Belgium.—October 4th. The Société Nationale des Chemins de Fer Vicinaux, of Brussels (14, Rue de la Science), are inviting tenders for the contract for the overhead electrical equipment in connection with the Salzinnes-Malonne (Malpas) section of the Onoz-Namur-Profondeville light electric railway.

Supply of two locomotive electric hoists and other rolling stock. Particulars of the Bourse, at Brussels.

Birkenhead.—October 6th. Electrical sundries, &c., for the Mersey Railway Co. (form No. 12). J. Shaw, general manager and secretary, Central Station.

Blackley.—October 10th. Extensions and alterations to electric bell and telephone installation, Booth Hall Infirmary, for Prestwich B.G. E. W. Ogden, clerk, Cheetham Hill Road, Manchester.

Bristol.—October 2nd. One 10-ton and eight 2-ton high pedestal travelling jib cranes, electrically driven, Royal Edward Dock, Avonmouth, for the Docks Committee of the T.C. W. W. Squire, Engineer, Cumberland Road (returnable deposit of £5).

Broom (near Durham).—October 5th. For supply of material and erection of 22 new lights, at Aldin Grange, Auton Stile, and Ushaw Moor. J. Bradley, clerk to the P.C., Broompark.

France.—The Chemins de Fer de l'Etat propose to acquire 450 electric motors for the electrification of the suburban tramways. Particulars from Le Service Electrique, 43, Rue de Rome, Paris.

Tenders will shortly be called for the supply of the equipment of the electricity station about to be built at Dunkerque. Particulars of the Administration de la Guerre, Paris.

ALGERIA.—October 15th. Tenders are invited by the municipal authorities at Bona for an electric pumping plant designed to pump water from the Bou-Glès water main to the Chateau d'Eau des Santons, a distance of nearly half a mile. The apparatus, which must lift 55 litres of water per second, will include a continuous current 440-volt motor. Prices must be submitted for two similar pumping installations, and should include delivery free on wharf Bona, and installation of the plant. Particulars from "Monsieur le Directeur du Service des Eaux, Hotel de Ville," Bona.—*Board of Trade Journal.*

Grimsby.—October 16th. Paper-insulated lead-covered cables, house fuse boxes, and mains service boxes for the Corporation. See "Official Notices" to-day.

Hastings.—October 18th. Electric lighting of the workhouse, Ore, for the B.G. See "Official Notices" September 15th.

Italy.—International tenders are invited for the supply of three electric cranes for the Marine station at Venice. Particulars, Italian State Railways, Rome.

Liverpool.—September 30th. Electric lifts and electric fittings for the Select Vestry, at the Workhouse, Brownlow Hill. G. W. Coster, vestry clerk, Brownlow Hill.

London.—L.C.C.—October 24th. Sub-station plant and machinery. See "Official Notices" September 15th.

HACKNEY.—October 12th. 100 000 pairs of white open type arc lamp carbons, for the B.C. See "Official Notices" September 22nd.

Manchester.—October 4th. One 4,000-4,500 KW. low-pressure exhaust type turbo-alternator, for the Corporation. See "Official Notices" September 15th.

October 3rd.—For (*a*) permanent way special track work; (*b*) permanent way points, tongues, and hardened steel centres; (*c*) granite setts. Specifications and forms of tender obtainable from Mr. McElroy, general manager. Deposit £2 2s. (returnable).

Perth.—The T.C. invites tenders for overhead coal storage hoppers, conveyors, capstans, and electric generating plant for stoking machinery, also alteration and extension of existing coal elevator and hoist. W. B. McLusky, gas engineer.

Spain.—The municipal authorities of Montemolin (province of Badajoz) have lately invited tenders for the concession for the electric lighting of the town during a period of 10 years.

Tenders have recently been invited by the municipal authorities of Grazalema (province of Cadiz) for the concession for the electric lighting of the town during a period of 20 years.

CLOSED.

Admiralty.—We understand that the North British Rubber Co., Ltd., of Edinburgh, who recently secured a contract for india-rubber shoes for the Admiralty, have now obtained a further large order, for ebonite.

Broxburn, N.B.—The Uphall and Broxburn Lighting Committee (engineer, Mr. W. Sanderson) has placed the following contracts for the supply of new generating plant for Broxburn electricity station:—

125-B.H.P. vertical suction gas engine and open hearth suction gas plant.—Campbell Gas Engine Co., Ltd., £1,200.

90-KW. D.C. generator.—Siemens Bros. Dynamo Works, Ltd., £250.

Cleethorpes.—The U.D.C. has accepted the tender of the Western Electric Co. for cables, and that of Ferranti, Ltd., for meters.

East Ham.—The T.C. has accepted a tender from Messrs. Babcock & Wilcox for the installation of mechanical chain grate stokers on two of the boilers at the generating station at £325 per boiler complete. An offer from Messrs. W. Wood & Co., to supply two reels of figure-8 trolley wire (about 2,700 lb.) at 7¾d. per lb., has been accepted.

Egypt.—The contract for a new double-track bridge at Assiut, at the crossing of the Ibrahimieh Canal, on the direct line between Cairo and Luxor, has now been awarded by the Egyptian State Railways and Telegraph Administration to Messrs. Baume and Marpent, of Haine St. Pierre, Belgium. Included in this bridge will be an electrically-operated swing span with a length of 68·80 metres in 13 panels of 5·292 metres, together with an approach span of 39 metres. The competition for this work partook of an international character, and it is stated that the tender submitted by Messrs. Baume & Marpent was the lowest.

Glasgow.—The following offers have been accepted by the Tramways Committee:—

Switchboard for Barrland Street Yard.—British Thomson-Houston Co., Ltd.
Copper rail-bonds.—R. R. Todd.
D.C.C. copper wire.—London Electric Wire Co., Ltd.; British Insulated and Helsby Cables, Ltd.
V.I.R. cables.—British Insulated and Helsby Cables, Ltd.

Haslingden.—The following are the successful contractors for the electric lighting installation of the municipal buildings:—

Secondary School.—Halliwell & Co.
Free Library and Public Hall.—A. M. Cramp.
Destructor Works.—Whipp & Bourne.

Heywood.—A contract for two stokers and self-cleaning compressed-air furnaces for the electricity works has been placed with Messrs. Ed. Bennis & Co., Ltd. This is a repeat order.

Italy.—The A.B. Glödlampfabrik, of Stockholm, were lately successful in competition for the supply of glow lamps to the Italian arsenals at Naples, Venice, Spezia and Taranto; unsuccessful competitors being the A.E.G., Thomson-Houston, and the German Glow-Lamp Syndicate.

London.—WOOD GREEN.—The U.D.C. has decided to enter into an agreement with the Chloride Electrical Storage Co., Ltd., for the maintenance of the accumulators at the baths for a period of 12 years, for a sum of £16 per annum.

Maidstone.—The T.C. has accepted the tender of Messrs. Wm. Cory & Son, Ltd., for 2,500 tons of Scotch screened washed peas, for the electricity works, at 11s. 6d. per ton, and 2,500 tons of York house-coal screenings, at 12s. 6d. per ton.

Mansfield.—Tenders for extensions to the specifications of the Borough Electrical Engineer have been accepted, and are as follows:—

Engines.—Belliss & Morcom, Ltd.
Dynamos.—British Thomson-Houston Co., Ltd.
Switchgear.—Bertram Thomas.
Buildings.—Vallance & Blythe.
Condenser, exhaust and water pipes.—Ledward & Beckett.
Electrically-driven pumps.—Rees Roturbo Manufacturing Co.
Steam pipes.—Mansfield Engineering Co.

Morecambe.—Mr. E. Ireland, of Bath, has secured the contract from the Morecambe Tramways Co. to reconstruct a section of their line totalling 1¼ miles. When the work is completed the section will be worked by petrol cars.

Pontymister.—Messrs. Babcock & Wilcox, Ltd., have, we understand, secured the contract for a complete plant for charging the open-hearth furnaces of the Monmouthshire Steel and Tinplate Co., Pontymister. The scheme includes an overhead crane and lifting magnet for discharging the pig-iron and scrap from the trucks, as well as for two of Messrs. Babcock & Wilcox's new ground-type slewing open-hearth charging machines, together with boxes and all accessories.

Portsmouth.—The E.L. Committee of the T.C. has accepted the tender of Messrs. W. T. Glover & Co. for cable, at £331.

Southend-on-Sea.—The T.C. has accepted the following tenders:—

Unit, Automobile and Marine Motors, Ltd.—Motor vehicle, for the Tramway Department, £350.
Messrs. Boydell & Co.—Nine feeder-pillars, £114.
Messrs. John Spencer & Co.—58 traction poles, £241.
Messrs. Wallington & Co., Ltd.—63 bracket-arms and fittings, and eight pole bases, £195.

Stoke-on-Trent.—The Corporation's £60,000 scheme for linking-up its four undertakings and carrying out necessary extensions is now well in hand. Contracts totalling £54,969 in the aggregate have been accepted in connection with the central power scheme, the following being a complete list of the accepted tenders to date:—

Turbo-generators.—Jas. Howden & Co., Ltd.	£8,905
Rotary converters.—British Westinghouse Co., Ltd.	3,800
Motor-converters.—Bruce Peebles & Co., Ltd.	2,250
Motor-generators.—Siemens Bros. Dynamo Works, Ltd.	2,385
Mains and cables.—Callender's Cable and Construction Co., Ltd.	13,093
Switchgear.—British Westinghouse Co., Ltd.	6,651
Boilers.—Stirling Boiler Co., Ltd.	5,040
Cooling towers.—Davenport Engine Co., Ltd.	1,053
Land	750
Burslem buildings.—Grants, Ltd.	615
New power-house buildings.—Grants, Ltd.	5,745
Stoke buildings.—J. Meikiejohn	925
Steam pipes, &c.—Aiton & Co.	1,129
Coal bunkers, &c.—New Conveyor Co., Ltd.	1,426
Steam feed-pump.—G. & J. Weir, Ltd.	118
Secondary battery.—D.P. Battery Co.	91
Transformers.—British Westinghouse Co., Ltd.	364
Motor-generator (D.C.).—Bruce Peebles & Co., Ltd.	225
15-ton crane.—Herbert Morris & Barlett, Ltd.	220
Electric feed-pump.—British Westinghouse Co., Ltd.	180

West Ham.—The T.C. has accepted the tenders of Messrs. Willans & Robinson, at £11,348, for a 5,000-KW. turbo-alternator, and that of Messrs. Babcock & Wilcox, at £9,790, for water-tube boilers.

Wigan.—The tender of the Rees Roturbo Co. for the supply of two electrically-driven centrifugal pumps, for pumping water to the top end of Whelley, has been accepted by the Corporation Water Committee.

THE ELECTRICAL ENGINEERS (LONDON DIVISION).

Commanding Officer—Col. H. M. Leay.

The following orders are issued :—

Drills for efficiency (1911-1912) will commence at Headquarters on Thursday, November 2nd, 1911, and Headquarters will be open as stated below from that date :—

Daily (except Saturdays), 10 a.m. to 10 p.m.
Saturdays (unless otherwise ordered), 10 a.m. to 12 noon.

(Signed) P. H. Campbell, Capt. R.E., Adjutant for O.C. London Electrical Engineers.

NOTES.

Free Tickets for Olympia.—Referring to the letter of "Supply Engineer" in our "Correspondence" columns to-day, we wish to point out that the fact that only a small proportion of the free tickets was utilised by the recipients ought not to be accepted as an argument in favour of refraining from their distribution, but, on the contrary, the number distributed should be increased. There is bound to be a considerable percentage of wastage, but if by distributing 100 tickets a supply engineer succeeds in inducing 20 actual or prospective consumers to visit the Exhibition, we maintain that his money has been well invested, for some at least of these are sure to increase their demand for energy, and the cost of the tickets will probably be amply covered in the first year.

As for the purchase of tickets being a form of subscription to the funds, that is quite a minor matter, for, as our correspondent must be aware, the tickets are supplied at a considerable reduction, largely on account of the wastage to which he alludes. Indeed, we are informed that at a meeting of the Exhibition Committee on Tuesday last, a further important concession was granted to supply station authorities who purchase a certain minimum number of tickets, in the shape of a large addition of free tickets to the number paid for, so as to provide against the loss in question. The Exhibition is now in excellent trim, and no time should be lost in purchasing and distributing the tickets; it is wonderful how far a man—or woman—will travel, to make use of a free pass!

Appointments Vacant.—Station fitter for the Beckenham U.D.C. Electricity Works (£2). Junior assistant for the Dewsbury Corporation Electricity Works (27s. 6d.) See our advertisement pages in this issue.

Legal.—The hearing of the Australian lawsuit, Balmain Electric Light and Power Supply, Ltd., *v.* Cormack, was reported in our issue of September 15th. We now learn that Mr. Acting Justice Rich has delivered his reserved judgment. He said that on the facts before him, A. W. Cormack, Ltd., which company the plaintiff did not think fit to make a party to the suit, was not a wrongdoer. It was not suggested that the acts were unlawful when done by that company. There seems, therefore, to be no reason for intervention on the part of the Court to restrain the company from doing the acts by any agent it thought fit, which would be the effect of an injunction against the defendant in this case. He, therefore, refused the injunction. He did not think, however, in view of the facts of the case, that defendant was entitled to costs, and he dismissed the motion, but without costs.

Accident at Johannesburg.—A serious accident occurred on August 31st at the Bantjes transformer house, of the Consolidated Mine, when four employés of the Victoria Falls Power Co. were injured by two explosions of oil. The first explosion took place in the current transformer at the distributing station, the burning oil catching F. Lefert (district engineer), and J. Doloughan (fitter). The former was burned on his hands and neck, and the latter on his hands, arms, face and back. He is seriously injured. At the same time an explosion occurred at the transformer station, the burning oil being thrown out from the switch. J. Eggen (fitter) and J. Meyer (electrician) were caught by this and badly burned about the face.

Olympia Electrical Exhibition.—During the run of the Exhibition the Electric Supply Publicity Committee will be well represented. There will be specimens of the various publications already issued, and designs for circulars forthcoming in the future, which should be of interest to managers, engineers, &c. A representative will be in attendance all the time to give any information or to take instructions. The Committee is to be accommodated in the Reception Room in the main gangway, near the entrance.

B.E.A.M.A. Inaugural Dinner.—The British Electrical and Allied Manufacturers' Association have decided that the dinner to celebrate the reorganising of this Association will be held at the Hotel Cecil on Thursday, October 12th, when it is hoped that there will be a strong muster of members of firms exhibiting and their friends at the Electrical Exhibition. Advantage will, no doubt, be taken of the occasion to make some pronouncement as to the future policy of the Association. Further details will be published later. Meantime, early application should be made for tickets by letter addressed to :—Mr. F. B. O. Hawes, Olympia, Kensington, W., or 36 and 38, Kingsway, W.C.; they may also be had from the following firms :—

London	Berry, Skinner & Co., 78, Upper Thames Street, E.C.
	The General Electric Co., Ltd., 71, Queen Victoria Street, E.C.
	Nalder Bros. & Thompson, Ltd., 34, Queen Street, Cheapside.
Birmingham ...	Chamberlain & Hookham, Ltd., Solar Works, New Bartholomew Street.
	The Electric and Ordnance Accessories Co. Ltd., Cheston Road, Aston.
Bradford	The Phœnix Dynamo Manufacturing Co., Thornbury Works.
Edinburgh	Bruce Peebles & Co., Ltd.
Gateshead-on-Tyne ...	The Sunbeam Lamp Co., Ltd., Park Road.
Glasgow	Mavor & Coulson, Ltd., 47, Broad Street, Mile End.
Manchester & district	Electromotors, Ltd., Openshaw.
	Ferranti, Ltd., Hollinwood.
	The Lancashire Dynamo and Motor Co., Ltd., Trafford Park,

or from the office of the Electrical Review, 4, Ludgate Hill, E.C.

St. Pancras Electric Lighting.—According to an evening newspaper, a case of legal anomalies was brought before Mr. Bros at Clerkenwell Police Court on 21st inst. A consumer of electricity supplied by the St. Pancras Borough Council had a dispute with that body about a fuse, and found that he could not appeal to anyone to decide it, as St. Pancras and Chelsea had their own Electric Lighting Acts,, which were passed before the L.C.C. got their Act giving them powers of inspection over the rest of the electric lighting concerns of London. The St. Pancras Act, he said, provided that an aggrieved consumer must ask a police magistrate to appoint an inspector, who should become the officer for the district. Neither the Board of Trade nor the L.C.C. could move in the matter. Mr Bros promised to take time to consider the novel proposal.

Inquiries.—A correspondent in South America who desires to run arc lamps on a 25-cycle traction circuit would be glad to know of any lamp that will burn satisfactorily (without flickering) on this frequency, or to receive suggestions that will enable him to get over the difficulty.

Electric Supply Cricket League.—We have received the following particulars of the points scored during last season by the clubs affiliated to this League, from which it will be seen that the St. James's Electric C.C. are the winners of the Cup this year :—

St. James's Electric C.C.	17 points.
City Electric C.C.	16 "
Kensington and Knightsbridge Electric C.C.	15 "
St. Pancras Electricity C.C.	8 "
Chelsea Electricity C.C.	4 "
Central Electricity C.C.	0 "

Mr. A. W. Seabright, hon. secretary and treasurer, 19, Cadogan Gardens, S.W., will be pleased to furnish any electricity supply cricket club with information concerning the League.

Overhead Wires.—According to a report in the *Times*, Mr. Hopkins sat at Lambeth Police Court as arbitrator to determine a difference which has arisen between the Postmaster-General and the Southwark Borough Council on a proposal to place overhead telegraph wires in certain thoroughfares within the district of the Council. Mr. Percy McIntyre, who represented the Postmaster-General, said that when the solicitor to the Post Office wrote asking the Borough Council to waive their objection to overhead wires, the town clerk replied that they were unable to do so, as they were firmly opposed to the principle of allowing these wires to be placed overhead. The wires would not be used for any other purpose than that of connecting up the firm-alarm posts with the fire station. The cost of placing these lines overhead would be something like £90, but if they were placed underground the cost would be £339, a difference of £250. Mr. A. Harrison, borough engineer, said his Council altogether objected to overhead wires in their district. The erection of the proposed posts and wires would be objectionable to the inhabitants and would tend to deteriorate the district. Mr. Hopkins reserved his decision.

Large Electrical Furnaces.—According to *Teknisk Ugeblad*, most of the furnaces now used at the saltpetre factories at Notodden, in Norway, have been built for 800 KW.; but experiments have been made with larger furnaces, even up to 4,000 KW., and the experience gained from the use of these has been so encouraging with regard to economy that it now has been decided to build a new type of furnace for 6,000 KW.

Institution and Lecture Notes.—The Iron and Steel Institute.—We learn from the secretary, Mr. G. C. Lloyd, that circumstances have arisen which have unfortunately led to the abandonment of the arrangements made to hold the autumn meeting of the Institute in Turin. Arrangements have therefore been made for the autumn meeting to be held (by kind permission) at the Institution of Civil Engineers, Great George Street, Westminster, on Thursday, October 5th, at 10.30 a.m. If necessary the meeting will be resumed in the afternoon. The following is the list of papers which have been submitted, a selection of which will be read and discussed :—

"Report on the Iron Ore Resources of Italy." (*a*) Sardinia, by Ing. L. Testa. (*b*) Brembana Valley, by Cav. G. Calvi. (*c*) Central Italy, by Ing. A. Ciampi. (*d*) Southern Italy and the Island Dependencies, by Prof. G. la Valle.

"On Temperature Influences on Carbon and Iron." By E. Adamson (Sheffield).

"On the Mechanical Influence of Carbon on Alloys of Iron and Manganese." By Prof. J. O. Arnold (Sheffield) and F. K. Knowles (Sheffield).

"On the Autogenous Welding of Metals." By Dr. Francesco Carnevali (Turin).

"On the Application of Electric Energy to the Manufacture of Iron and Steel in Italy." By Cav. Ing. Remo Catani (Rome).

"On the Present State of the Metallurgical Industry of Italy." By Signor Comm. Luigi Dompé and Cav. Francesco Saverio Pucci (Milan).

"On the Origin of the Iron Ores of Swedish Lapland." By L. L. Fermor (Calcutta).

"On New Industrial Processes for the Cementation of Steel." By Cav. Prof. Dr. Federico Giolitti (Turin).

"On Cementation with Gas under Pressure." By Prof. Dr. F. Giolitti and Dr. Francesco Carnevali (Turin).

"On the Transformation of Steel within the Limits of Temperature employed for Heat Treatment." By L. Grenet (Argenteuil, France).

"Researches on the Nature of the Phosphates contained in Basic Slag derived from the Thomas Gilchrist Dephosphorisation Process." By Victor Adolphe Kroll (Luxembourg).

The Association of Engineers-in-Charge.—The following arrangements are announced :—

Saturday, October 7th.—Visit to the Marconi Wireless Telegraph Co.'s Works at Chelmsford. Party to leave Liverpool Street at 1.55 p.m.

Wednesday, October 11th, at 8 p.m.—Presidential address by Mr. W. H. Maw, LL.D., M.Inst.C.E., &c., at St. Bride's Institute.

Saturday, October 28th.—First Social (Ladies' Night), at Liverpool Street Hotel.

Two special popular lectures will be given by Mr. Frederic H. Taylor, A.M.I.E.E., A.M.Inst.M.E., on "Recent Developments in Electric Lighting and Other Applications of Electricity" on October 4th and 6th next, commencing each evening at 8 p.m. Tickets may be had on application to the secretary at the Willesden Polytechnic, Priory Park Road, Kilburn, N.W.

Educational Notes.—Technical College, Finsbury.—The evening courses in electrical and mechanical engineering at the Technical College, Finsbury, begin on October 2nd and 3rd respectively. The lectures of the advanced electrical course on Monday evening will be given by Prof. Silvanus Thompson on Alternating Current Work and Dynamo and Motor Design. Mr. Simmons will give a few lectures on the Transmission and Distribution of Energy. On Wednesday evenings throughout the session lectures on Magnetism and the Design of Magnets will be given by Prof. Silvanus Thompson, and by Mr. Howgrave-Graham on Electrical Measurements and Illumination and the Elementary Principles of Dynamos, Transformers, &c.

In the Mechanical Department on Tuesday, October 3rd, the inaugural lecture by Mr. G. K. B. Elphinstone will be given at 8 p.m., the subject of the lecture being "Gyroscopes and the Gyro-Compass." Particulars of other lectures are given in our advertisement pages.

University College, Gower Street, London.—The College Calendar for 1911 has just been issued : it is a bulky volume of over 700 pages, and contains, besides the usual information, examination papers, &c., full particulars of the many new developments in the various faculties. In the Faculty of Engineering, a new lectureship has been instituted in Heating and Ventilating Engineering, with Mr. Arthur Barker as lecturer, and the special postgraduate lectures in advanced engineering subjects founded in previous years are detailed.

A Steamer Installation.—Messrs. W. C. Martin and Co., of Glasgow, are at present carrying out an installation on the large passenger steamer *Kaiser Franz Josef I*, built at Trieste, for a company belonging to that port. The equipment includes three turbo-generators of 145 kw. capacity ; a switchboard in the engine room, by which power is conveyed to auxiliary switchboards placed at various points ; and about 2,000 electric lights. Six arc lamps light the gangways and decks, and cluster fittings of large capacity are supplied to the hatchways, holds and stokehold. In connection with the liner's navigating lights, Messrs. Martin are fitting in the chartroom their patent duplex automatic masthead and sidelight indicator. For ventilation, 16 electrically-driven thermo-tanks supply hot or cold air by means of trunking to the various compartments. To ventilate the stokeholds, six electrically-driven Sirocco fans are to be used, and over 100 fans of different sizes will be in use in the public saloons, passengers' and officers' accommodation, &c. Electric power will work the provision hoists, engineer's lathe, potato peelers, dough-mixers, dish washers, sounding machine, and other appliances. It is stated that this is the largest electric light and power equipment yet fitted on any Mediterranean-built steamer.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—We are informed that our statement of last week of the appointment of Mr. Souden to Dewsbury is incorrect. The name of the gentleman appointed was given accurately in our issue of September 15th, namely, Mr. S. H. Fowles, of Newcastle-on-Tyne.

The marriage took place at Eccles Parish Church on September 21st, of Mr. Horace Wentworth Angus, second son of Dr. J. A. Angus, of Newcastle-on-Tyne, and electrical engineer to the Eccles T.C., and Miss Emma Beatrice Cowell, younger daughter of Mr. R. M. Cowell, of The Larches, Bindloss Avenue, Eccles. The presents included a silver coffee service from the chairman and members of the Electricity Committee, and a silver salver from the Corporation officials.

Mr. N. Tuffin has resigned his position of shift engineer with the Wycombe (Borough) Electric Light and Power Co., to take up similar duties in Sydney, N.S.W. Mr. P. F. Arendzen has been appointed engineer-in-charge to fill this vacancy.

Mr. L. E. Comley has resigned the post of switchboard attendant at the Dewsbury Corporation electricity works, in order to take up a similar post at Devonport Corporation electricity works.

Tramway Officials.—On leaving Bournemouth, Mr. C. W. Hill, the retiring general manager of the Corporation Tramways, was presented by the staff with an illuminated address and a leather writing cabinet, and a pair of water colours for Mrs. Hill. The chairman of the Tramways Committee made the presentation, paying a tribute to Mr. Hill's successful work during the 2½ years he had been in charge of the Bournemouth tramways system. One of the conductors gave a direct expression from the ranks of the tramways workers of the great regret felt at Mr. Hill's departure, and the gratitude of the whole of the staff for his thoughtfulness and care for those under him. The recipient suitably acknowledged the gifts. The Mayor paid a tribute to Mr. Hill's sterling work in connection with the feeding of the poor children in the borough, and his efforts on the Committee of the Saturday and Sunday Hospital Fund. Prior to the presentation the tramway staff, numbering nearly 300, attended service at St. Peter's Church, Bournemouth.

Mr. Caird and Mr. Galloway, traffic superintendent and tramways engineer respectively at Halifax, have been appointed dual managers of the tramways in the place of Mr. Rogerson, who has been relieved of his appointment as general manager, so that on account of developments in prospect, he may be able to devote his whole time to his other work as electrical engineer. A conference is to be held between the Tramways and Highways Committees with a view to the supervision and maintenance of the track being transferred to a special department of the Corporation.

The marriage took place last week of Mr. Matthew Francis Sheahan, assistant manager of the tramways department of the Leyton U.D.C., and Miss R. A. Trumble, daughter of Mr. John Trumble, of Leyton.

General.—A West Australian newspaper reports that at the end of August a social was held to welcome and congratulate Mr. James S. Fitzmaurice upon his appointment as electrical engineer for Western Australia. Mr. Fitzmaurice has been for many years assistant engineer in New South Wales, and for some months past had officiated as acting engineer for the State of Western Australia. The social was attended by the clerical, mechanical, and line construction staffs of the local telegraph and telephone departments. Mr. P. Kennedy, assistant engineer, occupied the chair.

The *Sydney Daily Telegraph* states that it has been decided by the Postmaster-General to establish a branch of the electrical engineering department in Dubbo, which will be in charge of Mr. E. West, of the Sydney branch. Mr. West will have a staff of officers.

The *Indian Textile Journal* reports that the Secretary of State has sanctioned the retention of Mr. F. W. Wilson, electrical inspector to the Bombay Government, for a period of three years.

The Portsmouth T.C. has decided to increase the salary of Mr. H. J. Andrews, engineer and manager of the telephone undertaking, from £260 per annum to £300.

Mr. W. Scott Taggart, M.I.Mech.E., has taken an office at 22, Bridge Street, Manchester, as consulting engineer in general engineering and textile work.

Obituary.—Mr. T. C. Clark, of the firm of Messrs. T. Clark & Co., electrical engineers, 129, Sloane Street, Chelsea, passed away suddenly while away for a holiday with his wife and friends at Weymouth. Deceased gentleman had suffered from a heart affection for a couple of years, and he succumbed to an attack which seized him while seated on the esplanade. Mr. Clark was 52 years of age. The business will be continued by his two brothers, Messrs. W. & E. Clark.

NEW COMPANIES REGISTERED.

Industrial Plant Co., Ltd. (117,763).—This company was registered on September 22nd, with a capital of £40,000 in £1 shares, to carry on the business of manufacturers of machinery, apparatus, appliances, cables and all kinds of plant for use in connection with the generation and supply of electricity, &c. The subscribers (with one share each) are:—J. E. Pigdon, Milburn House, Newcastle-on-Tyne, clerk; W. B. Glasson, Milburn House, Newcastle-on-Tyne, clerk; B. FitzGerald, 30, Windsor Terrace, Gosforth, clerk; D. Aitchison, 112, Brighton Grove, Newcastle-on-Tyne, cashier; T. W. Ward, 74, Tavistock Road, West Jesmond, Newcastle-on-Tyne, clerk; H. E. Nelson, 1, Maritime Terrace, Sunderland, clerk; H. W. J. Vertigan, 32, Honister Avenue, Newcastle-on-Tyne, clerk. Minimum cash subscription £5,000. The number of directors is not to be less than two or more than seven; the first are F. S. Newall and R. P. Sloan; qualification (except first directors), £500; remuneration as fixed by the company. Registered by Sayer, Ledgard and Smith, 13, Clifford's Inn, E.C.

Leitner Electrical Co., Ltd. (117,708).—This company was registered on September 19th, with a capital of £37,500 in £1 shares, to acquire from H. Leitner a licence to work the patents relating to inventions for the automatic electric lighting of trains, motor-cars and boats, &c. The subscribers (with one share each) are:—Right Hon. Viscount Templetown, 17, Victoria Street, S.W.; Captain J. D. Walker, D.S.O., Wilbury, Sunningdale; H. Leitner, Maybury, Woking, electrical engineer. Private company. The number of directors is not to be less than two or more than seven; the first are Right Hon. Viscount Templetown, E. T. Sturdy and Captain J. D. Walker; qualification, £100; remuneration (except managing director), £50 each per annum (chairman £25 extra). Registered office, 7, Princes Street, Westminster, S.W.

Glais Electrical Co., Ltd. (117,744).—This company was registered on September 21st, with a capital of £2,000 in £10 shares, to take over the electric light undertaking carried on by E. Lewis at the Electric Lighting Station, Glais, Clydach, Glam. The subscribers (with one share each) are:—E. Lewis, Graig-y-pal, Glais, mining engineer; E. Bevan, Tawe Stores, Trebanos S.O., colliery proprietor. Private company. The number of directors is not to be less than two or more that five; the first are E. Lewis, E. Bevan and W. Bowen; qualification, £200. Registered by Alfred H. Atkins, Ltd., 27-8, Fetter Lane, E.C.

Municipal Tramways Association (Incorporated). (the word "Limited" is omitted from the title by licence of Board of Trade), (117,780).—This company has just been registered with 300 members, each liable for £1 in the event of winding up, to promote, encourage and facilitate the construction, extension, working and interests of tramways, light railways, railless traction and motor omnibuses and similar works, and vehicles owned and worked by municipal corporations or other local authorities, and in particular of electric, steam and other modes of mechanical traction, and with a view to bring together officials and others interested therein. The subscribers are:—J. Dalrymple, 46, Bath Street, Glasgow, general manager, Corporation Tramways Department; H. E. Blain, Greengate Street, Plaistow, E., tramways manager, West Ham Corporation; C. J. Spencer, 7, Hall Ings, Bradford, general manager, Corporation Tramways; A. L. C. Fell, 62, Finsbury Pavement, E.C., chief officer, L.C.C. Tramways; J. Aldworth, Beastmarket Hill, Nottingham, general manager, Corporation Tramways Department; H. Linsley, J.P., 7, Bank Place, Salford; A. R. Fearnley, Division Street, Sheffield, general manager, Corporation Tramways. The management is vested in a council, the first members of which are:—J. Dalrymple, H. E. Blain, C. J. Spencer, A. L. C. Fell, J. Aldworth, H. Linsley, J.P., A. R. Fearnley; A. Baker, County Buildings, 147, Corporation Street, Birmingham (general manager, Corporation Tramways); P. Fisher, Town House Buildings, Dundee (general manager, City Tramways); S. Flint, tramways department, Leicester (chairman, Corporation Tramways Committee); J. B. Hamilton, City Square, Leeds (general manager, City Tramways); J. H. McElroy, 55, Piccadilly, Manchester (general manager, Corporation Tramways); H. Mosley, Queen's Gate, Burnley (general manager, Corporation Tramways); W. F. Russell, 48, West Regent Street, Glasgow (Convener, Corporation Tramways Committee); L. Slattery, 64, Finsbury Pavement, E.C. (traffic manager, L.C.C. Tramways); and E. R. Pickmore, town clerk, Town Hall, Liverpool. Registered by A. R. Fearnley, Division Street, Sheffield.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Maxim Lamp Works, Ltd. (108,018).—Charge on the company's undertaking and property, present and future, including uncalled capital, dated September 4th, 1911, to secure all moneys due or to become due from the company to Barclay & Co., Ltd., 54, Lombard Street, E.C.

Corona Lamp Works, Ltd. (116,527).—Issue on August 22nd, 1911, of £200 debentures, part of a series of which particulars have already been filed.

Tubes, Ltd. (91,224).—Return dated June 27th, filed August 17th, 1911. Capital £100,000 in £1 shares. All shares taken up; £1 per share called up on 82,859; £82,859 paid; £17,141 considered as paid on 17,141 shares. Mortgages and charges: £51,500.

Hindhead and District Electric Light Co., Ltd. (75,361).—Issue on September 8th of £200 debentures, part of a series of which particulars have already been filed.

Llanelly and District Electric Lighting and Traction Co., Ltd. (64,341).—Two mortgages, dated September 1st, 1911 (supplemental to trust deed dated August 3rd, 1911, securing £60,000 debenture stock). Property charged: Certain lands and premises in Llanelly. Trustees: Century Insurance Co., Ltd., 18, Charlotte Street, Edinburgh.

Electric Construction Co., Ltd. (39,292).—Return, dated August 3rd, filed August 10th, 1911. Capital £400,000 in £2 shares (50,000 preference). 112,100 ordinary and 31,390 preference shares taken up. £2 per share called up on 2,100 ordinary and 18,245 preference. £40,690 paid. £246,290 considered as paid on 110,000 ordinary and 18,145 preference. Mortgages and charges: £182,700.

Electric and General Investment Co., Ltd. (31,506 C).—Return, dated August 10th, filed August 17th, 1911. Capital £200,000 in £5 shares (30,000 ordinary, 100 founders' and 19,900 preference). All shares taken up. £1 per share called up on ordinary and £5 per share on the founders' and preference. £120,000 paid. Mortgages and charges at date of return: £10,000; since issued, £22,500. Capital increased to £301,500 by the creation of 80,000 deferred shares of 1s. each, on August 18th, 1911. Return of allotments made up to August 18th shows whole of the deferred shares allotted for cash.

Ingleby & Co., Ltd. (117,463).—Particulars of £2,000 debentures, created September 13th, 1911, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

"Z" Electric Lamp Manufacturing Co., Ltd. (96,594).—Particulars of £10,000 second debentures, created July 17th, 1911, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £4,700. Property charged: The company's undertaking and property, present and future, including uncalled capital, but excluding certain patent rights, subject to £25,000 first mortgage debentures. No trustees.

Chesham Electric Light and Power Co., Ltd. (90,833).—Return dated July 14th, 1911; capital £25,000 in £1 shares; 15,007 shares taken up; £1 per share called up on 7; £7 paid; £15,000 considered as paid on 15,000 shares. Mortgages and charges, £8,200.

Chili Telephone Co., Ltd. (29,252).—Return dated August 3rd; filed August 18th, 1911; capital £360,000 in £5 shares; 66,000 shares taken up; £5 per share called up on 44,000; £220,000 paid; £110,000 considered as paid on 22,000 shares. Mortgages and charges, nil.

Crompton & Co., Ltd. (27,200).—Return dated August 14th, filed August 15th, 1911. Capital, £300,000 in £3 shares: 85,000 shares taken up; £3 per share called up on 83,000; £249,000 paid; £6,000 considered as paid on 2,000 shares. Mortgages and charges: £175,000.

Ecuador Telephone Co., Ltd. (29,295c).—Return dated August 3rd, filed August 4th, 1911. Capital, £100,000 in £5 shares; 5,000 shares taken up; £25,000 paid. Mortgages and charges: Nil.

CITY NOTES.

German Electrical Companies.

THE first financial year of the Deutsche Gluhlampenfabrik, of Plauen, Saxony, which acquired glow lamp patents from the firm of J. P. Wild, for the sum of £15,000, comprises a period of nine months ended with June 30th, 1911. After allocating £300 to depreciation, the accounts show a loss of £2,400, which has been carried forward. The share capital amounts to £100,000, of which paid-up shares represent £56,000.

The Deutsche Elektrizitätswerke Garbe, Lahmeyer & Co., of Aix-la-Chapelle, have just celebrated the twenty-fifth year of the existence of the firm by the allocation of £5,000 to the provident fund for officials and workmen. Including the balance of £5,000 brought forward, the accounts for 1910-11 indicate gross profits of £102,000, as compared with £78,000 in the preceding year. After meeting management expenses, and placing £8,300 to the depreciation fund, there remain net profits of £38,900, as contrasted with £26,600 in 1909-10. It is proposed to pay a dividend of 5 per cent. for the year, being the same rate as in the previous 12 months, and to carry forward the sum of £14,800.

The report for 1910-11 of the Wolfram Lampen Gesellschaft, of Augsburg, states that notwithstanding the receipt of sufficient orders during the greater portion of the year, great exertions were necessary in order to keep the works constantly employed. Orders were more actively coming to hand in accordance with the approach of the lighting season, although an improvement in the whole situation of business could not be ascertained. The downward course of the movement in prices, together with the advent of difficulties in manufacture which could now be regarded as overcome, unfavourably influenced the results for the year. The years of efforts to secure foreign markets had been accompanied by noteworthy success in the past 12 months, but the business necessitated a considerable sacrifice. The time seemed to have not yet arrived for the formation of a combination of makers of metallic-filament lamps, although an agreement of the kind would be of far-reaching importance to the glow lamp industry, as it would only in that way be possible to again obtain better prices. The accounts show, after apportioning £8,900 to depreciation, as against £9,600 in 1909-10, a loss of £4,200 as compared with profits of £2,100 in the preceding year, on a share capital of £150,000.

Underground Electric Railways Co. of London.

THE half-yearly meeting was held on Tuesday last week, at Electric Railway House, Broadway, Westminster, S.W., Sir Edgar Speyer, Bt., presiding.

The CHAIRMAN, in moving the adoption of the report (see page 387), said he thought the shareholders would agree that they were satisfactory, both as regarded what had been done and what they might infer from them might be done in the future. They showed good progress, but he need hardly point out again that, although the results were better, the dividends paid on the share capital of the railway companies were not by any means a fair or adequate return on the large amounts invested in these enterprises. As regards the accounts, the revenue account showed total receipts of £158,536, an increase of £10,921, or 7¼ per cent. on the first half of 1910, and the net revenue, before allowing for income bond interest, was £39,497, a gain of £13,104, or 49 per cent. The income derived from investments was £105,975, or £15,678 more than in the first half of the previous year. This increase was chiefly due to the better earnings of the London Electric Railway Co. The revenue from holdings in the Metropolitan District Railway Co. in the half-year under review was practically unchanged, but the outlook in that respect justified the hope of some improvement in the current six months. The rents of properties rose from £1,462 to £2,679. In the first half-year of 1910, under the guarantee in respect of Metropolitan District assented first preference stock, the company had to provide on balance £1,343, but on this occasion the Underground received on balance £2,686. Satisfaction with

these results had already been expressed in the report, but he desired to emphasise this favourable feature, and to point out that this company was now deriving, after having waited for many years, the full benefit of its guarantee of a 3½ per cent. dividend on about one-third of the Metropolitan District first preference stock. Their administration expenses showed a decrease from £5,032 to £3,390. As in the case of the last half-year of 1910, they had again abstained from taking credit in the revenue account during the half-year under review for interest accrued on unpaid calls on shares of the company. The interest accrued to the end of the half-year, June 30th, amounted to £22,000. As pointed out on a former occasion, the directors considered this a good debt, but that it was conservative to keep the balance in reserve for the present. He need not refer to the working results of the several companies in which the Underground Co. was interested, as the chairman of these companies had fully explained the affairs of their undertakings, and it was not necessary for him to repeat any of their statements, as they had no doubt read them. The most important event of the half year from the shareholders' point of view had been the passing of the Metropolitan District Railway Act of 1911, which received the Royal Assent on June 2nd last. As a result of this Act, the arrangements for the sale of the power house to a Joint Committee of the London Electric and the Metropolitan District Railway Companies had been successfully concluded. The Lot's Road power house undertaking would be transferred to the Joint Committee, which consisted of three members of the board of the District Railway Co., and three members of the board of the London Electric Railway Co., and would be leased by the Joint Committee to the two companies for 999 years as from January 1st, 1912. The consideration payable to the Underground Co. was the proceeds of the sale of £2,200,000 joint power house rent charge stock. The money thus obtained would redeem the entire existing issue of £1,000,000 4 per cent. power house debentures, and £1,088,700 4½ per cent. bonds of 1933, while the sum realised by the sale of the London Electric preference stock referred to in his last speech had already liquidated the £1,000,000 5 per cent. prior lien bonds. They would see from this that the Underground Co. within 12 months would have reduced its fixed-charge debt by no less than £3,088,700. Moreover, when the transfer of the power house had taken place, the surplus of about £630,000 realised in excess of the book value of the power house undertaking would be applied in wiping out that amount of suspense items which now stood at about £1,000,000 on the assets side of the balance-sheet. He thought he was justified in congratulating the shareholders on the successful results of these transactions. He referred in his last speech to the Westinghouse award, and informed them that the Westinghouse Co. would appeal against it, but they were advised that the award was good. The appeal had not yet been heard, but they hoped it would come on after the long vacation, so that when he had the honour of addressing them again at the next meeting, this matter should be finally disposed of. The opinion then expressed by their legal advisers as to the validity of the award was unchanged.

Lord George Hamilton, G.C.S.I., seconded the motion, and the report was adopted.

Dundee, Broughty Ferry and District Tramways Co., Ltd.—The directors report that for the year ending July 31st, 1911, the profit (including the sum brought forward from last year), after providing for interest on debenture stock, amounts to £5,163. From this there falls to be deducted, interim dividend paid on preference shares for half-year to January 31st, 1911, at the rate of 6 per cent. per annum, £1,500; leaving a balance of £3,663, which the directors propose to deal with as follows:—(1) In payment of final dividend on preference shares at the rate of 6 per cent. per annum for half-year ending July 31st, 1911, £1,500; (2) to renewals fund, £600; (3) to sinking fund for redemption of debenture stock, £600; (4) to pay dividend on the ordinary shares at the rate of 2 per cent. per annum for year ending July 31st, 1911, £574; (5) to carry forward to next account, £388. The earnings of the tramways remain approximately the same as last year, the traffic receipts on the working account showing a decrease of £46. With better trade conditions traffic receipts should substantially increase without affecting working conditions.

Mexican Light and Power Co.—A dividend of 3½ per cent. has been declared for the six months ending October 31st, 1911, on the preference shares, and a dividend of 1 per cent. on the ordinary shares.

Shawinigan Water and Power Co.—The directors announce an issue forthwith of $1,000,000 of new common stock at the price of $108 per share (Montreal terms), on the basis of one share of new stock for each nine shares held.

Babcock & Wilcox, Ltd.—The directors have declared an interim dividend at the rate of 24 per cent. per annum (2s. 4¼d. per share), free of income-tax, on the ordinary shares for the half-year to June 30th.

Winnipeg Electric Railway Co.—A quarterly dividend of 12 per cent. per annum is announced.

Cumberland Telephone and Telegraph Co.—The directors have declared a quarterly dividend of 2 per cent.

Mexico Tramways Co.—A dividend of 1¾ per cent. has been declared for the quarter ending September 30th, 1911, on the issued capital stock.

Cleveland and Durham Electric Power Co., Ltd.

The report, as abstracted in the *Financier*, states that the gross profit for the year to June 30th was £20,973, as compared with £12,942 for the previous year. After providing for debenture and other interest there is a net profit of £8,342, which it is proposed to carry to the next account. During the past year the capital expenditure on the works was £9,107. The connections to the company's system at June 30th aggregated 40,460 H.P., an increase of 4,177 H.P. connected during the year. In addition to this, 12,500 H.P. has been recently contracted for, and other important negotiations are proceeding. Arrangements are being made to work for a term of years further waste heat generating stations at the Tees Furnace Co.'s ironworks, Redcar, the Port Clarence Works, the Ayresome Ironworks belonging to Messrs. Mills & Co., and also the Redcar ironworks of Messrs. Walker, Maynard & Co. The scheme for the rearrangement of the capital of the company received the confirmation of the High Court in December, and the capital now stands reduced by £299,915, which has been applied to the writing down of assets.

The annual meeting was held at Newcastle-on-Tyne on September 26th. Mr. James Falconer, M.P., chairman, presided, and in moving the adoption of the report, he said that the net result of the year's working was a gross profit of £20,973, as compared with £12,942 last year, an increase of £8,041. Contracts had been made with consumers this year amounting to 4,177 H.P. At the beginning of the year they had contracts amounting to 36,283 H.P.; the contracts now amounted to 40,460. In addition, though the works to be supplied had not been completed, they had secured further contracts to supply 12,500 H.P. These figures showed a steady and satisfactory progress. The progress had been hindered considerably through the trade disputes of the year. A satisfactory feature was the fact that the company had been able to secure arrangements for operating four additional waste heat stations, thus increasing the supply of electricity and effecting economies. With regard to the capital, it would be necessary to make arrangements for providing connections for the business which they had secured, and which it would be necessary to carry out in the next year or two. With a view, therefore, of providing for that, the directors had arranged for the issue of the remaining portion of the second debentures. This did not appear in the accounts, but it would appear next year. The amount was £28,000, and they would be issued on the same terms as the previous debentures were issued. In answer to a question as to the payment of an interim preference dividend, the chairman said they could not do that, as that dividend depended on the profits which it was intended to distribute in each year, and that could not be ascertained until the year's end.

Mr. Philip Noble seconded the report.

Mr. A. Gemmell opposed the adoption of the report. He said he failed to see any satisfactory feature in the business at all. The gross profits were most unsatisfactory, and some £5,000 more would be required next year for the payment of interest. In the past five years the bulk of electricity supplied to the Northern Counties Co., which was a prominent feature in the prospectus, had failed to produce any dividend. After criticising the policy of the directors, Mr. Gemmell stated that the directors had spent all the money they had set out to spend five years ago, and now they found themselves in the position of having to hire plant from the Waste Heat Co. He advocated a thorough independent investigation by a business expert of the first rank.

The Chairman said he did not think it was desirable in the interests of the company to go into the matters referred to by Mr. Gemmell, as they had been fully discussed and satisfactorily explained at the previous annual meeting. Those matters had all been disposed of, and as a matter of fact, they had no bearing whatever upon the points before them, and did not really come into the scope of that particular company.

The report was then carried with one dissentient.

Mr. M. L. Bell was re-elected a director, and Mr. Wm. Swan was re-elected auditor.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to:—

Rio de Janeiro Tramway, Light and Power Co., Ltd.—Further issue of 62,500 shares of $100; 62,500 shares of $100; 1,250 shares of $100; and 28,750 shares of $100 each.

Welsbach Light Co., Ltd.—265,000 shares of £1 each, fully paid.

And to allow the following securities to be quoted in the Official List:—

Calcutta Electric Supply Corporation, Ltd.—Further issue of 40,370 5 per cent. cumulative preference shares of £5 each, fully paid, Nos. 120,001 to 160,370.

Eastern Extension Telegraph Co., Ltd.—The directors have declared an interim dividend for the quarter ended June 30th last of 2s. 6d. per share.

Direct Spanish Telegraph Co., Ltd.—The board have decided to pay, in addition to the dividend at the rate of 10 per cent. per annum on the preference shares, an interim dividend at the rate of 4 per cent. per annum, free of income-tax, on the ordinary shares, both for the half-year ended June 30th, 1911, and payable on October 2nd next.

Continental.—Switzerland.—The Oerlikon Engineering Co., of Oerlikon, near Zurich, is declaring a dividend of 4 per cent. for the last financial year, the same as for the preceding 12 months.

MARKET QUOTATIONS.

Wednesday, September 27th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	,,	22/-	..
a ,, Oxalic	,,	1 8/-	..
a ,, Sulphuric	,,	5/6	..
a Ammoniac Sal	,,	42/-	..
a Ammonia, Muriate (crystal)	per ton	£29	..
a ,, ,,	,,	£30	..
a Bleaching powder	,,	£5 10	..
a Bisulphide of Carbon	,,	£18	..
a Borax	,,	£16	..
a Ferro-Silicon (50 %)	,,	£10 10	..
a Copper Sulphate	,,	£20	..
a Lead, Nitrate	,,	£24	..
a ,, White Sugar	,,	£22 15	..
a ,, Peroxide	,,	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a ,, Chlorate	per lb.	3½d.	..
a ,, Perchlorate	,,	4½d.	..
a Potassium, Cyanide	,,	7d.	..
a Shellac	per cwt.	68/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	,,	£6 10	..
a ,, Recovered	,,	£5 10	..
a ,, Lump	,,	£5 5	..
a Soda, Caustic (white 70 %)	,,	£11	..
a ,, Chlorate	per lb.	3⅜d.	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
a ,, Cyanide (basis 100 %)	,,	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£70	..
b ,, Wire, in ton lots	,,	£102	..
b ,, Sheet, in ton lots	,,	£120	..
p Babbitt's metal ingots	,,	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7¾d.	..
c ,, Tube (brazed)	,,	9d.	..
c ,, ,, (solid drawn)	,,	7¼d.	..
c ,, Wire, basis	,,	7d.	..
c Copper Tubes (brazed)	,,	9⅜d.	..
c ,, ,, (solid drawn)	,,	8⅜d.	..
g ,, Bars (best selected)	per ton	£71	..
g ,, Sheet	,,	£71	..
g ,, Rod	,,	£71	..
e ,, (Electrolytic) Bars	,,	£67 10	10/- dec.
e ,, ,, Sheets	,,	£73 10	10/- dec.
e ,, ,, Rods	,,	£60 10	10/- dec.
e ,, ,, H.C. Wire	per lb.	7⅛d.	⅛d. dec.
f Ebonite Rod	,,	5/8	..
f ,, Sheet	,,	4/9	..
m German Silver Wire	,,	1/11	..
h Gutta-percha, fine	,,	5/- to 7/-	Dec.
h India-rubber, Para fine	,,	4/9½	1d. dec.
f Iron Pig (Cleveland warrants)	per ton	46/9	..
f ,, Wire, galv. No. 8, P.O. qual.	,,	£14	..
g Lead, English Pig	,,	£13 5	£1 7 6 dec.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£8 12 6	7/6 dec.
d Mica (in original cases) small	per lb.	6d. to 2s.	..
d ,, ,, ,, medium	,,	2/6 to 4/-	..
d ,, ,, ,, large	,,	4/6 to 8/6	..
p Phosphor Bronze, plain castings	,,	11d.	..
p ,, ,, rolled bars & rods	,,	1/0½.	..
p ,, ,, rolled strip & sheet	,,	1/1	..
o Platinum	per oz.	172/6	..
e Silicium Bronze Wire	per lb.	8½d.	½d. dec.
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	,,	£182 to £183	£1 dec.
n ,, Wire, Nos. 1 to 16	per lb.	2/1	..
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh't (Vieille Montagne bnd.)	,,	£33	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

United Electric Car Co.—The annual meeting was held on September 20th at Preston, Mr. G. Richardson presiding. Referring to a net profit for the year of £4,420, the chairman said the directors considered the returns satisfactory in view of the stagnant state of the car-building industry during the year. The available balance for the year was £5,482, and the directors felt satisfied in recommending a dividend of 6 per cent. on the preference shares, leaving £2,482 to be carried forward. Although their creditors were shown to be £17,000 more than last year, half that sum represented cash received on account of contracts not yet executed. The debts were rather heavier, but all were good. After regretting the loss on the Hadley and Trafford Park works, the chairman said the directors had decided to deal with the loss in the following way:—To write £10,000 from the general reserve, £36,171 for depreciation reserve—total, £46,171. This method would reduce their depreciaton and general reserve to £7,328. Replying to a question, the chairman said there were now 710 men employed by the company, against 327 in 1910. Messrs. Prestwich and Barningham were re-elected directors.

STOCKS AND SHARES.

Tuesday Evening.

No sooner does one cause of trouble seem to be removed to some farther sphere, than another arises to take its place, and to unsettle the stock markets. Although the Moroccan difficulties are supposed to be in a fair way of pacification, a fresh source of trouble has appeared in the shape of friction between Italy and Turkey over the question of Tripoli. Up to the present, however, not much importance is attached to the threatened rupture in that direction, but its influence has certainly not made for the benefit of the Stock Exchange at large.

The Home Railway market has been alternately buoyant and depressed. Part of the heavy losses incurred last week have been wiped out by an upward movement—started, there can be no doubt, by the bear division. Last Saturday the market looked decidedly good, but on Monday the Tripoli *affaire* was used as an excuse for letting prices down again. To-day, Tuesday, has brought better markets again, and once more Home Rails look stronger; the rise being based on rumours that the Tripoli dispute has been settled amicably.

Central London stocks are weaker, the Deferred having fallen back to 49. City and South London shed ¼, and Metropolitan Consolidated, after being a good market, went back to their previous figures, to rise again with the steam stocks. The movement amongst prior charge descriptions of the Home Railway companies continues towards lower levels, and Metropolitan 3½ per cent. Convertible Preference is 2 down. District 3½ per cent. Guaranteed fell a point, although the Ordinary stock slightly hardened after its fall. Within the past few days the £10 fully-paid Ordinary shares of the Underground Electric Railways Company have been accorded an official quotation, and are nominally 30s.

Hastings Tramways Preference are also back in the Official List, the price being 15s. middle, while the company's 4½ per cent. Debenture stock at 78½ is a point better. British Electric Traction Ordinary are ¼ higher, the Preference being left unchanged at 3⅛, while the First Debenture stock eased off to 93½. The foreign list is also a little dull. Latin-Canadians have recovered to some extent from the free selling that came from the Continent, but the market remains in a somewhat tender condition, and Sao Paulo, for example, show a loss of 2, Mexico Trams a fall of 1, while Rios are ¼ better at 115¼. Fluctuations in the bonds are insignificant, and a trifle irregular. Anglo-Argentine Trams First Preference receded to 5⅛ upon a little selling, and British Columbia Electric 5 per cent. Preference put on a point, which was jestingly attributed to the defeat of reciprocity between Canada and the United States. As a matter of fact, the landslide in Canadian politics has not affected the markets in the securities with which we deal, nor is it considered likely that it will carry much influence either one way or the other.

Electricity Supply and Power shares are very quiet, changes in the home market being confined to a fall of ⅛ in Newcastle Preference, due to some slight selling pressure from the North. Amongst the London Companies there is no alteration in prices whatever. The foreign group is also very colourless. Madras Ordinary suffered a nominal fall of ⅜, which took the price down to 2⅜—a drop which surprised even some of the dealers in the market themselves. Calcutta Preference shares hardened to 5¼ on the assumption that the coming Durbar should be a good thing for the Calcutta Company. In the Canadian group, Montreal Ordinary rose 2, and Shawinigan Water was advanced a point. On the other hand, Canadian General fell 2, and Northern Light and Power bonds have recommenced to crumble, the price at 38 showing a drop of 2 points. Mexican Light and Power issues are unchanged, with the exception of ½ fall in the company's 5 per cent. First Mortgage bonds. At the present price of 93½ the yield is certainly attractive, and if it were not for the financial difficulties that still exist in various centres where Mexican issues are favoured, there is little doubt that this quotation would bring in investment buying.

On the eve of the Anglo-American Telegraph Company's meeting, at which the agreement with the Western Union will be passed or rejected, activity in the Anglo stocks has come to something of a standstill. The Preferred fell to 111½, and the Deferred, in which there is most speculation, drooped to a shade below 25. Direct United States Cable shares shed ½. The energetic campaign which is being conducted by President Taft against the Trusts in the United States gives pause to many who otherwise consider Anglo-American Preferred to be a good second-class investment, and the result of the meeting is awaited with keen interest. West India and Panama shares are again $\frac{1}{16}$ higher, and Eastern Telegraph Debenture stock hardened to 103½ middle. Marconis eased off to 45s., notwithstanding the fresh advertisement afforded to wireless telegraphy by the transmission of numerous messages from the *Olympic* after the collision last week with the *Hawke*. Reuters shares continue to be steadily bought, and once more there is a rise of ½, which lately seems to have become a weekly institution. The Eastern group is steady.

Buyers have come along again for National Telegraph Deferred, and the price has been taken up to 118¼, more than wiping out the 2 points lost last week. The two Debenture stocks are each ½ higher, but the Second Preference sustained a small set-back.

Amongst manufacturing shares, Babcock & Wilcox have risen ¼ to 5¾, but an excellent report from the Dick, Kerr Company did not prevent the Preference shares from easing off $\frac{1}{16}$, making the middle price 20s., at which the return is a round 6 per cent. on the money. For an industrial investment of this type, this looks a good share, because the fluctuations in the price are as a rule quite small. British Westinghouse Preference are a little harder at 7s. 6d. middle, while Castner-Kellner, receding to 3$\frac{5}{16}$, dropped the $\frac{1}{16}$ improvement which they picked up last week.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1909.	Dividends for 1910.	Closing Quotations Sept. 26th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord.	10	5⅛	5⅛	7⅞ — 8⅜	..	6 5 9
Do. 4½ % Pref.	10	4½	4½	8¼ — 9¼	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10 — 10½	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	101 —103	..	4 7 5
Brompton & Kensington, Ord.	5	10	10	7⅜ — 8⅛	..	6 3 1
Do. 7 % Cum. Pref.	5	7	7	7⅜ — 7⅝	..	4 7 6
Central Electric Supply, 4 % Guar. Deb.	100	4	4	99 —102	..	3 18 5
Charing Cross, West End & City	5	5	5	3⅞ — 4⅛	..	5 19 2
Do. 4½ % Cum. Pref.	5	4½	4½	4½ — 5	..	4 10 0
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅛	..	5 5 11
Do. Do. 4 % Deb.	100	4	4	94 — 98	..	4 1 8
Chelsea, Ord.	5	4½	5	3⅞ — 4⅜ xd	..	5 14 3
Do. 4½ % Deb.	Stock	4½	4½	98 —100	..	4 10 0
City of London, Ord.	10	7	7	12 — 12½	..	5 12 0
Do. 6 % Cum. Pref.	10	6	6	11⅜ — 12⅛	..	4 14 1
Do. 5 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb.	100	4½	4½	100 —103	..	4 7 5
County of Durham, 5 % First Mort. Deb.	Stock	5	5	89½ — 91½	..	5 9 3
County of London, Ord.	10	5	5	7⅜ — 7⅞	..	6 7 0
Do. 6 % Pref.	10	6	6	10⅝ — 11⅛	..	5 6 8
Do. 4½ % Deb.	Stock	4½	4½	108 —110	..	4 1 10
Do. 4½ % Second Deb.	Stock	4½	4½	100⅛ —103⅛	..	4 7 0
Edmundson's, Ord.	5	Nil	Nil	⅜ — ½	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	2 — 2¼	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	..	5 4 8
Folkestone	5	5½	6	4⅜ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4¾ — 5⅛	..	4 15 8
Do. 4½ % First Deb.	100	4½	4½	95 — 98	..	4 11 10
Hove	5	8½	9	6⅞ — 7⅜	..	6 2 0
Kensington & Knightsbridge, Ord	5	8	9	6⅜ — 7⅛	..	6 0 0
Do. 4 % Deb.	Stock	4	4	91 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	3	2	2	1⅝ — 2	..	3 0 0
Do. 6 % Pref.	5	6	6	4¼ — 4⅞	..	6 3 1
Do. 4 % First Mort. Deb.	Stock	4	4	89 — 92	..	4 7 0
Metropolitan	5	5	5	3⅞ — 4¼	..	5 17 8
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅝	..	4 14 9
Do. 4½ % First Mort. Deb.	Stock	4½	4½	100 —105	..	4 5 9
Do. 3½ % Mort. Deb.	Stock	3½	3½	84½ — 87½	..	4 0 0
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96¼ — 98¼	..	4 11 5
Newcastle-on-Tyne	5	4	4	3¾ — 4	..	5 0 0
Do. 5 % Pref., Non. Cum.	5	5	5	3¾ — 3⅞	— ⅛	6 9 0
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	101 — 104	..	4 16 2
Notting Hill	10	7½	8	..	..	..
Oxford	5	7	7½	6 — 6½ xd	..	5 11 6
St. James' and Pall Mall, Ord.	5	10	10	8⅜ — 9½	..	5 8 1
Do. 7 % Pref.	5	7	7	6¼ — 7¼	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 87	..	4 0 6
Smithfield Markets, Ord.	5	Nil	Nil	1⅜ — 1⅝	..	Nil
South London, Ord.	4	5	5	2⅜ — 3	..	6 13 4
Do. 5 % First Mort. Deb.	100	5	5	98½—101½	..	4 18 6
South Metropolitan, 7 % Pref.	1	7	7	1 1/16 — 1 1/16	..	5 17 11
Do. 4½ % First Deb. Stock	100	4½	4½	97 —100	..	4 10 0
Urban, Ord.	5	5	5	½ — 1	..	..
Do. 5 % Cum. Pref.	5	5	5	2 — 2½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	87½ — 89½	..	5 0 7
Westminster, Ord.	5	10	10	7½ — 8	..	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 5⅛	..	4 7 10

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅝	..	5 6 8
Calcutta, Ord.	5	8	8½	6⅝ — 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	5 — 5⅛	+ ⅛	4 10 11
Calgary Power, 1st Mort. Bds.	100	5	5	96 — 98	..	5 2 0
Canadian Gen. El. Com.	$100	7	7	103 —108	—2	6 9 8
Do. 7 % Pref.	$100	7	7	121 —125	..	5 12 0
Cordoba Lt., Power and T., Ord.	1	2	3	⅝ — ¾	..	3 8 4
Do. 5 % Deb.	100	5	5	94 — 97	..	5 3 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	..	6	94 — 96	..	6 5 0
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	84½ — 87½	..	5 14 3
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	85 — 87	..	5 14 11
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	Nil	1/16 — 3/16	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	8 6 8
Kaministiquia Power, 5 % G. Bs.	$500	5	5	101½—103½	..	4 16 7
Madras, Ord.	5	Nil	..	2⅛ — 2⅜	— ⅛	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	95 — 97	..	5 3 1
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	86½ — 88½	..	5 13 0
Mexican Lt. & Power, Common	$100	4	4	85 — 87	..	4 12 0
Do. 7 % Cum. Pref.	$100	7	7	106 —108	..	6 9 8
Do. 5 % 1st Mort. Gold Bds.	..	5	5	92½ — 94½	— ½	5 5 10
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	88 — 90	..	5 11 1
Montreal, Lt., H. and Power	$100	6	7	167 —172	+2	4 1 5
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5	37 — 39	..	12 3 10
River Plate, Ord.	Stock	9	10	218 —228	..	4 7 9
Do. 6 % Non-Cum. Pref.	Do.	6	6	107 —114	..	5 5 8
Do. 5 % Deb. Stock	Do.	5	5	101½—103½	..	4 16 7
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital	$100	4	4	115 —117	+1	3 8 5
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	108 —105	..	4 5 9
Toronto Power, 4½ % Deb.	Do.	4½	4½	100 —102	..	4 8 3
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92 — 94	..	5 6 5
Victoria Falls Power, Pref.	1	Nil	Nil	1/16 — 1	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	..	6	105 —107	..	5 12 2

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	Nil	7⅜ — 7⅞	..	Nil.
Do. 5 % Deb. Red.	Stock	5	5	99 —101	+ ½	4 19 0
American Telep. & Teleg., Cap.	$100	8	8	138 —140	..	5 14 4
Do. Collat. Trust	$1000	4	4	94 — 96	..	4 3 4
Anglo-American Telegraph	Stock	3⅜	3⅜	67 — 69	..	5 8 8
Do. 6 % Pref.	Do.	6	6	111 —112	—1	5 7 2
Do. Def.	Do.	25/-	30/-	24⅜ — 25½	— ⅛	5 19 5
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	..	4 17 1
Chili Telephone	5	8	7	6⅛ — 7⅜	..	4 18 3
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	87⅜ — 89⅜	..	4 9 5
Cuba Telegraph	10	6	6	10⅜ — 11	..	5 9 1
Do. 10 % Pref.	10	10	10	17⅜ — 18½	..	5 9 7
Direct Spanish Telegraph, Ord.	5	4	4	3⅞ — 4	..	5 0 0
Do. 10 % Cum. Pref.	5	10	10	8⅜ — 8¾	..	5 14 3
Do. 4½ % Debs.	50	4½	4½	100 —102	..	4 8 3
Direct United States Cable	10	4½	4½	7⅜ — 8⅛	— ⅛	5 9 1
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 —101	..	4 9 1
Eastern Telegraph, Ord. Stock	Stock	7	7	137 —140	..	5 0 0
Do. 3½ % Pref. Stock	Do.	3½	3½	84 — 86	..	4 1 5
Do. 4 % Mort. Deb.	Do.	4	4	102½—104½	+ ½	3 16 7
Eastern Extension	10	7	7	13⅜ — 14	..	5 0 0
Do. 4 % Deb.	Stock	4	4	100½—102½	..	3 18 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	100 —102	..	3 18 5
Globe Telegraph and Trust	10	5⅞	5⅞	10⅜ — 11	..	5 6 10
Do. 6 % Pref.	10	6	6	13 — 13½	..	4 8 11
Great Northern Telegraph	10	18	18	30⅜ — 31½	..	5 14 3
Indo-European Telegraph	25	13	13	56⅜ — 58½	..	5 11 1
Mackay Companies Common	$100	4	5	83 — 85 xd	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	74 — 76 xd	..	5 5 3
Marconi's Wireless Telegraph	1	Nil	Nil	2 3/16 — 2 5/16	— 3/32	..
Monte Video Telephone, Ord.	1	6	6	7/16 — 1	..	6 0 0
Do. 5 % Pref.	1	5	5	3/16 — 5/16	..	5 10 4
National Telephone, Pref.	Stock	6	6	104 —106	..	5 18 2
Do. Def.	Do.	6	6	117 —120	+3	5 0 0
Do. 6 % Cum. 1st Pref.	10	6	6	9⅝ — 10⅜	..	5 12 11
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅛ — 10⅜	— ⅛	5 17 1
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5 1/16 — 5 3/16	..	4 9 11
Do. 3½ % Deb.	Stock	3½	3½	96 —101	+ ½	3 9 4
Do. 4 % Deb.	Do	4	4	99 —101	+ ½	3 19 3
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	102½—103½	..	4 7 0
Oriental Telep. and Elec.	1	8	8	1⅜ — 1⅝	..	4 18 6
Do. 6 % Cum. Pref.	1	6	6	1 1/16 — 1 1/8	..	4 11 5
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 8 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	99½—101½	..	3 18 10
Reuter's	8	5	5	9 — 9½	+ ⅛	4 4 3
Submarine Cables Trust	Cert.	6	6	133 —136	..	4 8 3
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99 —101	..	4 9 1
United River Plate Telephone	5	8	8	7⅛ — 7½	+ 1/16	5 6 8
Do. 5 % Cum. Pref.	5	5	5	5⅛ — 5⅜	..	4 10 11
West Coast of America	2½	2½	2½	1⅜ — 1⅝	..	6 5 0
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	98 —100	..	4 0 0
West India and Panama Teleg.	10	Nil	⅜	2⅜ — 3	+ 3/16	2 10 0
Do. 6 % Cum. 1st Pref.	10	6	6	10⅛ — 10⅝	..	5 12 11
Do. 6 % Cum. 2nd Pref.	10	14½	6	9⅛ — 10⅜	..	5 17 1
Do. 5 % Debs.	100	5	5	101 —103	..	4 17 1
Western Telegraph, Ltd.	10	7	7	13⅜ — 13⅝	..	5 1 10
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 17 8
Western Union Tel., 4 % Bnds. A	$1000	4	4	107 —110	..	3 12 9
Do. 4½ % Fdg. Bonds	$1000	4½	4½	101 —104	..	4 6 7

* Unless otherwise stated, all shares are fully paid.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for		Closing Quotations Sept. 26th.	Rise + or Fall —	Present Yield p.c.
	*	1909.	1910.			£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅛ — ¼	..	Nil
Do. 5 % Pref.	1	5	5	⅜ — ⅝	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8 5
Brit. Elec. Trac., Ord.	10	Nil	Nil	⅞ — 1⅜	+ ⅛	Nil
Do. 6 % Pref.	10	1½	1½	8⅜ — 8⅝	..	3 17 5
Do. 5 % Deb.	100	5	5	92 — 96	—1	5 5 3
Do. 4½ % 2nd Deb.	100	4½	4½	74 — 78	..	5 15 5
Central London Railway, Ord.	100	3	3	65 — 67	—1	4 9 7
Do. Pref.	100	4	4	85 — 87	..	4 12 0
Do. Def.	100	2	2	48 — 50	—1	4 0 0
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 11
City & South London, Ord.	100	1½	1½	28⅜ — 29½	— ½	5 1 8
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	103 —105	..	4 15 3
Do. Do. 1908	100	5	5	102 —104	..	4 16 2
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 7
Dublin United Trams, 6 % Pref.	10	6	6	11 — 12	..	5 0 0
Great Northern & City, Pr'f. Ord	10	Nil	Nil	⅞ — 1⅛	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	Nil	⅜ — ½	..	Nil
Do. 4½ % Deb.	100	4½	4½	76 — 81	+1	5 11 1
Isle of Thanet Trams, 5 % Pref.	5	1¼	2½	2½ — 3	..	4 3 4
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	79 — 82	..	6 1 11
London Elec. Railw'ys, 4 % Deb.	100	4	4	96 — 98	..	4 1 8
London United Trams, 5 % Pref.	10	Nil	Nil	8 — 8½	..	Nil
Do. 4 % Deb.	100	4	4	72 — 76	..	5 5 3

NAME.	Stock or Share.	Dividends for		Closing Quotations Sept. 26th.	Rise + or Fall —	Present Yield p.c.
	*	1909.	1910.			£ s. d.
Metropolitan Railway Consol.	100	1	1⅜	41⅞ — 42¼	+ ½	3 5 1
Do. Surplus Lands	100	2⅜	2⅞	64 — 66	..	4 3 4
Do. 3½ % Deb.	100	3½	3½	89 — 91	—1	3 16 11
Do. 3½ % Pref.	100	3½	3½	86 — 88	—1	3 19 7
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	—2	4 1 5
Metropolitan District Ord.	100	Nil	Nil	23½ — 24	+ ½	Nil
Do. 6 % Deb.	100	6	6	145 —147	..	4 1 8
Do. 4 % Deb.	100	4	4	96 — 98	..	4 1 8
Do. 4 % Prior Lien	100	4	4	100 —102	..	3 18 5
Do. 4½ % First Pref.	100	Nil	3⅜	85 — 87	..	3 14 9
Do. 3½ % Gtd.	100	3½	3½	73 — 75	—1	4 13 4
Metropolitan Elec. Trams, Ord.	1	5	5½	33/16 — 1 5/16	..	5 6 8
Do. Def.	1	Nil	Nil	31/32 — 1 1/32	..	Nil
Do. 5 % Pref.	1	5	5	1 — 1 1/16	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	99 —101	..	4 9 1
Do. 5 % Deb.	100	5	5	102 —104	..	4 16 2
Potteries, Ord.	1	2	2	1 7/16 — 1½	..	..
Do. 5 % Pref.	1	5	5	1 7/16 — 1 9/16	..	7 12 4
Do. 4½ % Deb.	100	4½	4½	88 — 91	..	5 18 11
South Metro. Trams, 6 % Pref.	1	3	6	1 3/16 — 1 5/16	..	10 3 0
Do. 4 % Deb.	100	4	4	73 — 78	..	5 15 5
Underground Elec. Railways	10	..	..	1 3/16 — 1 5/16	..	..
Do. 4½ % Bonds	100	4½	4½	98 —100	..	4 10 0
Do. 6 % Income	100	Nil	1	59 — 61	..	1 12 9
Do. Power House Debs.	100	..	4	101 —103	..	3 17 8
Yorkshire (West Riding), Ord.	5	Nil	Nil	1 7/16 — 1 9/16	..	Nil
Do. 6 % Pref.	5	Nil	Nil	2⅜ — 2½	..	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5	5 — 5⅛	— 1/16	4 15 3
Do. 2nd Pref.	5	5	5	4⅜ — 5	..	5 0 0
Do. 4 % Deb.	100	4	4	93½ — 95½	..	4 8 9
Do. 4½ % Deb.	100	4½	4½	101 —103	..	4 7 5
Do. 5 % Deb.	100	5	5	101 —103	..	4 17 1
Auckland Trams, 5 % Deb.	100	5	5	102 —105	..	4 16 2
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11⅛	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	96⅜ — 98⅜	..	4 11 5
Do. 5 % 2nd Deb.	100	5	5	97 — 99	..	5 1 0
Brisbane Trams Invt., Ord.	5	8	8	6⅜ — 7⅛	..	5 12 3
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 18 0
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	8	138 —142	..	5 12 8
Do. Pref. Ord.	100	6	6	119 —123	..	4 17 7
Do. 5 % Pref.	100	5	5	107 —110	+1	4 10 11
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	101 —104	..	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	101½ —103½ xd	..	4 5 4
Calcutta Trams, Ord.	5	4½	6	5⅜ — 6⅛	..	4 16 0
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 8
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
Cape Electric Trams	1	Nil	Nil	1/16 — 1/8	..	Nil
City Buenos Aires Trams (1904)	5	5	5	5⅛ — 5⅜	..	4 12 6
Do. 4 % Deb.	100	5	5	95 — 98	..	5 2 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	95 —100	..	5 0 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	100 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	Nil	7/16 — 9/16	..	Nil
Do. 5 % A Deb.	100	5	5	92½ — 95½	..	5 4 9
Do. 6 % B Deb.	100	6	6	63 — 67	..	7 9 3

La Plata Elec. Trms, Prf.	1	6	6	1 5/16 — 1 7/16	..	5 18 0
Lisbon Elec. Trams, Ord.	1	5½	5½	1 — 1⅛	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	97 —101	..	4 19 0
Madras Elec. Tr. (1904), Deb.	100	5	5	95 — 98	..	5 2 0
Manaos Trams & Lt., 1st Deb.	100	..	5	90 — 92	+ ½	5 8 8
Manila Elec. R. and Lig., Bonds	$1000	5	5	98 —100	..	5 0 0
Mexico Trams Com.	$100	7	7	114 —116	—1	6 0 8
Do. Gen. Con. 5 % Bonds	..	5	5	96½ — 98⅛	+ ⅛	5 1 6
Do. 6 % Bonds	100	6	6	97 — 99	— ⅛	6 1 3
Para Elec. Rlys. & Lt., Ord.	5	..	10	6⅞ — 7⅛	..	7 0 4
Do. 6 % Pref.	5	6	6	5⅞ — 6⅛	..	5 4 4
Do. 5 % 1st Deb.	100	5	5	99⅛ —101⅛	..	4 18 6
Perth (W.A.) Elec. Tr., Ord.	1	2½	2½	1 3/16 — 1 5/16	..	2 7 1
Do. 5 % 1st. Deb.	100	5	5	101⅛ —103⅛	..	4 16 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅝ — 5⅞	..	5 6 8
Do. 4½ % 1st Deb.	100	4½	4½	98 —101	..	4 9 1
Rio de Janeiro Trams	$100	1	4½	114⅞ —115⅞	+ ⅛	3 17 9
Do. 1st Mort. 5 % Bonds	..	5	5	101 —102	— ⅛	4 18 0
Do. 5 % Mort. Bonds	100	5	5	97⅞ — 98½	..	5 1 6
Sao Paulo Tram, Lt. and P.	$100	10	10	171 —174 xd	..	5 14 11
Do. 5 % 1st Deb.	$500	5	5	102½ —104½	..	4 15 8
Singapore Trams, 5 % Deb.	100	5	5	83 — 87	..	5 15 0
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95⅛ — 97⅛	..	5 2 7
Un. Elec. Trams Monte Video	5	5	6	5⅜ — 6	..	5 0 0
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	102 —105	..	4 15 8
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	105 —107 xd	..	4 4 1

MANUFACTURING COMPANIES.

Aron, Ord.	1	..	Nil	3/32 — 5/32	..	Nil
Do. 6 % Pref.	1	12	9	1 1/16 — 1 3/16	..	7 7 8
Babcock & Wilcox	1	24	26	5⅜ — 5¾	+ ⅛	4 8 5
Do. Pref.	1	6	6	1⅛ — 1¼	..	4 0 0
B.I. & Helsby Cables	5	10	10	6⅞ — 7⅛ xd	..	6 17 11
Do. Pref.	5	6	6	5⅞ — 6⅛	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 97	..	4 12 9
British Westinghouse, Pref.	3	Nil	Nil	1/16 — 1/8	+ 1/32	Nil
Do. Deb.	100	4	4	59 — 62	..	6 9 1
Do. 6 % Prior Lien	100	6	6	102 —104	..	5 15 5
Browett, Lindley, Ord.	1	Nil	Nil	1/6 — 2/-	..	Nil
Do. Pref.	1	Nil	Nil	5/- — 6/-	..	Nil
Brush, Ord.	2	Nil	Nil	1/16 — 1/8	..	Nil
Do. 7 % Pref.	2	Nil	Nil	1/16 — 1/8	..	Nil
Do. 4½ % Deb.	100	4½	4½	56 — 61	..	7 7 7
Do. 4½ % Second Deb.	100	4½	4½	39 — 44	..	10 4 6
Callender's Cable	5	15	15	9 — 9½	..	7 17 11
Do. Pref.	5	5	5	4 13/16 — 5 3/16	..	4 16 5
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
Castner-Kellner	1	14	17½	3½ — 3⅝	— 1/16	4 16 7
Do. Deb.	100	4½	4½	103 —107	..	4 4 1
Crompton & Co.	3	Nil	Nil	1/16 — 1/8	..	Nil
Do. Deb.	100	5	5	67½ — 67½	..	7 8 2

Dick, Kerr	1	6	5	13/16 — 15/16	..	5 6 8
Do. Pref.	1	6	6	1 5/16 — 1 7/16	— 1/32	5 12 11
Do. Deb.	100	4½	4½	95 — 98	..	4 11 10
Edison & Swan, A, £3 paid	5	Nil	Nil	3/4 — 13/16	..	Nil
Do. fully paid	5	Nil	Nil	1⅜ — 2⅛	..	Nil
Do. 4 % Deb.	100	4	4	67 — 71	..	5 12 8
Do. 5 % Second Deb.	100	5	5	78 — 81	..	6 3 5
Electric Construction	2	Nil	2½	1/16 — 1/8	..	6 13 4
Do. Pref.	2	7	7	1 1/16 — 1 1/8	..	7 4 4
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8⅛	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	8½ — 9	..	5 11 1
Do. Deb.	100	4	4	88 — 93	..	4 6 0
Henley's, Ord.	5	15	15	12 — 12⅜	..	5 17 8
Do. Pref.	5	4½	4½	4 13/16 — 5⅛	..	4 5 11
Do. Deb.	100	4½	4½	106⅜ —108½	..	4 2 11
India-Rubber, G. & T.	10	10	10	13⅜ — 15½	..	6 9 0
Do. Pref.	10	5	5	9⅞ — 10⅜	..	4 16 5
Telegraph Construction	12	17½	20	84⅛ — 86⅛	..	6 11 7
Do. Deb.	100	4	4	100 —102	..	3 18 5
Willans & Robinson	1	Nil	Nil	1/16 — 1/8	..	Nil
Do. Pref.	5	1½	Nil	1/8 — 1/4	..	Nil
Do. Deb.	100	4	4	55 — 65	..	6 3 1

* Unless otherwise stated, all shares are fully paid.

Bank rate of Discount 4 per cent., September 21st, 1911.

THE BRITISH ASSOCIATION.—IV.

The Manufacture of Nitrogen Compounds by Electric Power.

By Ernest Kilburn Scott, A.M.Inst.C.E., M.I.E.E.

Section G. (*Abstract.*)

The following paper draws attention to several methods of fixing the nitrogen of the air with the help of cheap electric power, and it also gives particulars of some of the products. The processes were started on a commercial scale in Norway and Italy about six years ago and they are now well established, the principal products being the artificial manures :—

(*a*) Nitrate of lime, containing 12¾ per cent. nitrogen.

(*b*) Calcium cyanamide or nitrolim, with 18 per cent. nitrogen.

These manures are now being made at prices which compare favourably with the older artificial manures such as nitrate of soda and sulphate of ammonia when calculated on the nitrogen contents. For actual delivery to farmers, prices are perhaps not so favourable, because the quantities handled are small and the selling organisation is not so complete. The prejudices of the farmers have also to be overcome, and much propaganda expense is therefore necessary.

Detailed descriptions of the two processes are given below, but it may be here mentioned that in the nitrate of lime process, as introduced by Birkeland and Eyde, the nitrogen is fixed *directly* from the air in the electric furnace, and nitric acid made from this fixed gas then acts on carbonate of lime. In the calcium cyanamide process, which was first introduced by Frank and Caro, the nitrogen is first isolated from the air and then absorbed by carbide of calcium, itself an electric furnace product.

It will thus be seen that a principal difference between the two processes is that the cost of raw materials for nitrate of lime is low, whereas in the case of calcium cyanamide the nitrogen has to be specially prepared by the Linde process, and the carbide of calcium, by which it is absorbed (made from lime and coke or anthracite) costs about £6 a ton.

The nitrate of lime process is certainly unique amongst industrial processes in using a raw material—nitrogen—that costs nothing ; but, on the other hand, more electric energy is required for a given amount of nitrogen fixed. The prices of the resulting products are therefore very similar.

Many agricultural experts have tested these manures, and conclusively proved that when properly applied they are very valuable for increasing plant growth, also that they are especially useful for cereals—wheat, oats, &c., that require large quantities of nitrogen.

As the Chilian deposits of nitrate of soda and the virgin soils of the world are rapidly becoming exhausted, and, at the same time, there is a steady increase in the number of wheat-eating people, it is fortunate that new sources of nitrogen manures have been developed. The output is small at present, but it promises to be the greatest development of electrical engineering science of the near future. Already, by steadying the prices of the older manures, the new electrical methods have been of great benefit to agriculturalists.

Besides manures, many other materials are made by these processes, and the writer specially draws attention to the manufacture of nitrogenous products for explosives.

The nitric acid made by the nitrate of lime process can be concentrated to any value, and sold for the manufacture of explosives, such as gun-cotton, dynamite, smokeless powder, &c.

Ammonium nitrate, which is the main constituent in the manufacture of safety explosives and laughing gas, is made by the very simple process of mixing the weak nitric acid that comes from the absorption towers of the Birkeland-Eyde process, with ammonia liquor obtained from English gas works. The solution is crystallised and dried, and the resultant, containing 35 per cent. of nitrogen, is sold freely in England at £27 a ton.

This material is also made from calcium cyanamide, and the Lothringen Works at Gerthe, near Bochum, produce about 2,000 tons per annum. As this does not come on the market, it is presumably all taken by the German Government as a substitute for nitroglycerine.

As it contains so large a percentage of nitrogen it would make an excellent manure, and, of course, it may be possible at some future time to manufacture it cheaply enough for fertilising purposes.

Dicyandiamide, which is made from calcium cyanamide, is an extremely valuable material for explosives, because it acts as a deterrent, and by reducing the heat it is not so liable to destroy the rifling.

At the present time this country is largely dependent on overseas supplies for the manufacture of explosives, and we should be in an extremely serious position in case of war. It may be remembered that at the time of the Napoleonic wars the French were in great straits for saltpetre with which to make powder ; it behoves us, therefore, not to be caught in the same predicament. In a few rounds a modern gun blows away into the air as much nitrogen as was used right through a war of the last century. The necessity of having factories where explosives can be made quite independent of materials from overseas is therefore all the greater.

It would be well at this stage to describe briefly the processes for manufacturing nitrate of lime, as carried out at Notodden, and calcium cyanamide, as carried out at Odda, in Norway.

It should be mentioned that calcium cyanamide is made in the following countries : Italy, France, Switzerland, Dalmatia, United States, Canada, Mexico and Japan, whilst in Germany alone there are about half-a-dozen factories.

The Birkeland-Eyde magnetic arc furnace, as installed at Notodden, consists of a circular sheet steel drum about 8 ft. in diameter and 2 ft. wide, lined with refractory fire-brick, and having a disk-like space in the centre, 6½ ft. in diameter and 1½ in. wide. Air is supplied at the centre of the furnace at a gentle pressure by a Roots blower, whilst a channel round the periphery of the disk space carries off the gases and unoxidised air.

Two electrodes project into the centre of the furnace, and are generally approached to within about one-third of an inch. They are copper tubes, 6 in. in diameter and ¾ in. thick, and have water circulation to keep them cool. Surrounding the points of the electrodes there is a magnetic field of about 4,500 lines of force per square centimetre. Alternating current at 5,000 volts, 50 periods per second, is supplied to the electrodes, whilst, of course, direct current flows round the coils to produce the magnetic field.

When an arc is struck between the electrodes, it is at once deflected in a direction perpendicular to the lines of force. The necessity of having alternating current applied to the electrodes will be appreciated from the fact that with direct current the arc would be deflected to one side only. As each electrode is alternatively positive and negative the arc is projected outwards first to one side and then to the other, thus giving a disk of flame about 6 ft. in diameter. The speed at which the arc moves outwards is extremely rapid, and as the formation of a new arc is practically instantaneous, it appears to the eye as a constant sheet of flame.

When the extremities of the arc retire along the electrodes, the arc increases in length, its resistance also increasing, until the tension is such that a new arc strikes between the points of the electrodes. The resistance of this short arc being smaller, the tension of the electrodes suddenly sinks to a point that will not sustain the long arc, which is thus extinguished. It should be noted that an inductive resistance is a very necessary piece of apparatus to have in series with the arc, because its self-induction automatically effects a displacement of phase according to the currents flowing, thus enabling the arc to burn steadily. The power factor is, of course, thereby lowered, so it is necessary to make an allowance when estimating sizes of alternators and cables.

A curious feature of the arc flame is that it is not quite concentric. When looked at through coloured glasses the extremities of the arc appear like glowing spots upon the sides of the electrodes ; and on the positive electrode, they are small, and fairly close together, whilst on the negative electrode they are larger, and farther apart. The reason for these spots appears to be that the arcs solder themselves, so to speak, to the electrodes, and the magnetic lines of force make the extremities of the arcs move along in leaps. For some reason not yet explained, the extremities of the arc cling more closely to the negative than to the positive electrode, and, therefore, the flame extends farther along the positive electrode than along the negative.

When the flame is burning it emits a loud noise, from which the furnace attendant can judge roughly the number of arcs formed per second. The electrodes are changed and repaired every 300 hours, and the fireproof lining every fourth to sixth month. The temperature of the flame is about 3,500° C., and the temperature of the escaping gases is between 800° and 1,000°. A furnace of 1,000 H.P. costs with its inductive resistance and fittings about £1,000, but as a good deal of the expenditure is common to any size of furnace, the 4,000-H.P. furnaces recently made only cost about 50 per cent. more.

On leaving the furnaces, the air only contains about 1 per cent. of nitric oxide gas. This gas and the unoxidised air pass from the channel round the periphery of each furnace into two collecting pipes, lined with fire-brick. They convey the gas and air to steam boilers, where the temperature is much reduced, the heat given off being used to raise steam for concentrating the products, and for driving the air compressors for pumping the acids and soda. The gas and air then go through tubes in the evaporating tanks, which brings the temperature down to about 200°. At 600° C. the nitric oxide gas begins to change to nitrogen peroxide, but complete conversion only takes place at 140° C., and then only slowly.

The temperature is lowered still further, to 50° C., by passing the gas and air through a number of aluminium tubes over which cold water is flowing. They then enter oxidation tanks, which are large vertical iron cylinders having acid-proof linings. The gas stays here some time and gradually changes to nitrogen peroxide, the percentages being now about 98 per cent. air and 2 per cent. nitrogen peroxide.

The next process is to bring the nitrogen peroxide into contact with water to form nitric acid, and this is done in two series of towers, built of granite and filled with broken quartz, these substances being chosen because they are not affected by acid.

The gas and air enter the bottom of the first tower, travel up through the quartz, and then pass by an earthenware pipe to the top of the second tower. They travel down this and pass to the bottom of the third tower, and so on, aluminium fans being fitted on each tower to help the circulation. Water and nitrous and nitric acid slowly trickle down through the quartz of each tower, and this meeting the nitrogen peroxide gas, the latter becomes absorbed. It will be noted that the liquid moves from tower to tower in the opposite direction to the gas, so it is worked to some extent on the contra-flow principle.

When the liquid reaches the bottom of the first tower it contains about 40 per cent. of acid ; the liquid in the tank at the bottom of the second tower contains 25 per cent., that at bottom of third tower 15 per cent., and that at bottom of fourth tower 5 per cent. The liquid is pumped from tower to tower by compressed air.

When the nitric peroxide gas first comes in contact with the water and acid it forms the two acids, nitric acid and nitrous acid. The nitrous acid then decomposes into nitric acid and nitric oxide, and the latter gas again oxidises to nitric peroxide. This

nitric peroxide, meeting with more water, forms more nitric acid and nitrous acid, and so the process goes on until nearly all the nitrogen peroxide is absorbed.

It would only be possible to convert all the nitric oxide into nitric acid by having exceedingly large absorption towers and by giving plenty of time. Therefore, the last traces of the gas are removed by two extra alkaline towers in which sodium nitrite is formed.

Pure nitric acid is made by taking the 40 per cent. solution which is obtained by direct absorption and concentrating it up to 60 per cent. by distillation. Then repeating the distillation with twice the weight of 92 per cent. sulphuric acid to take up the surplus water gives 98 per cent. nitric acid. During the process the sulphuric acid is reduced in strength to about 80 per cent., and it is then concentrated back again to 92 per cent. The waste heat of the gas and air coming from the furnace is used for these concentrations.

It may be noted that nitric acid can also be concentrated electrolytically, and the Salpetersaure Industrie Gesellschaft, of Gelsenkirchen, in Austria, has such a process in operation.

Nitrate of lime can be bought for £7 15s. per ton of 20 cwt. c.i.f. English port, guaranteed to contain 12¾ per cent. of nitrogen, but in no case has it contained less than 13 per cent. Nitrate of soda containing 15 per cent. of nitrogen should cost £9 2s. 6d. c.i.f. English port to compare in equal unit value.

Nitrate of lime probably acts on the soil in much the same way as nitrate of soda, but it has the advantage over nitrate of soda of depositing calcium carbonate. The other manure, sulphate of ammonia, not only does not add lime to the soil, but it can only do its work by acting on the lime already in the soil, and therefore it gradually impoverishes it of that material.

In 1905, Dr. Schonherr, working in conjunction with Mr. Hessberger and the Badische Anilin und Soda Fabrik, of Ludwigshafen, invented a furnace by which an arc of great density is made to burn steadily inside a long iron tube, air being blown through the tube with a whirling motion, so that the air moves in a path like a screw.

In a plant at work at Christiansand, the furnaces are worked in sets of three, one to each phase, each taking 600 H.P. at 4,200 volts. Each tube is 16 ft. long, fixed vertically, and the electrode at the bottom consists of an iron rod which passes through a copper water-cooled tube. The iron rod is pushed upwards as it burns away to ferric oxide, fresh rods being screwed on as required, so that the process is not stopped.

Air enters the tube tangentially by a number of holes near the electrode, this giving the important feature—namely, the whirling motion of the air. At the top of the tube there is the water cooler, and it is inside here that the arc ends by striking across from the centre to the side of the tube.

Before it reaches the arc the air passes through annular tubes, on each side of which there are the hot gases from the furnace. The air is thus heated to about 500° C. before it reaches the arc. After passing through the arc, where some of it is heated to about 3,000° C., it reaches the water cooler, and its temperature is then suddenly reduced. Where the arc strikes into the side of the tube there is a sudden mixing of the highly heated nitric oxide next to the arc, with the cooler air that is whirling past, and at this point the gas becomes permanently fixed. The nitric oxide and air leave the top of the cooler at about 1,200° C. and pass away to a gas flue, common to all the furnaces, where the temperature is reduced to about 850° C.

Up to this point the gas has been colourless nitric oxide, but directly its temperature sinks below 600° C. a further quantity of oxygen is taken up, and the reddish-brown nitrogen peroxide gas begins to form. The gases are still further cooled by being taken through boilers, where they raise steam, and then to an oxidation tank.

The balance-sheet of the heat energy is roughly as follows:—

40 per cent. goes in heating the water of the cooler.

17 per cent. is lost in radiation from walls of furnace, pipes, &c.

30 per cent. raises steam in the boilers.

10 per cent. is lost by cooling with water after passing the boiler.

Leaving only 3 per cent. as actually used for making the nitric oxide gas.

In the 600-H.P. furnace at Christiansand the arc is 16 ft., but in later 1,000-H.P. furnaces it is 23 ft. long. This larger furnace requires about 40,000 cb. ft. of air per hour.

The inductive resistance is an important adjunct of this, as well as the Birkeland-Eyde furnace, because it effectively prevents another arc starting at the bottom of the tube and running up. When the arc is burning steadily the voltage sinks to a point at which it cannot jump across from the electrode to the tube near it.

The plant at Christiansand is employed solely in making sodium nitrite for the Badische Analin und Soda Fabrik.

The sodium nitrite made from the nitrogen of the air is so satisfactory and cheap compared with the old methods that now practically the whole supply of the world, valued at £160,000, is obtained from electrical furnaces. It may be mentioned, however, that it only takes about 12,000 H.P. to give such a supply, so that the proposition is a very different one to the manufacture of nitrate manures, where the demand is practically unlimited.

The Pauling furnace is being exploited by the Salpetersaure Industrie Gesellschaft at Gelsenkirchen, Austria, and at other places. This furnace is made on the lines of the well-known horn break lightning arrester, and it consists of two hollow iron electrodes (cooled with water) arranged to form a vee which at the lowest point is about 4 cm. across. At this point there are two lighting knives which can be approached to within a few millimetres, and are readily adjustable. The arc strikes across and runs up the diverging electrodes by reason of the natural convection currents, and the repelling action of its own magnetic field, but principally because of a blast of heated air from a nozzle immediately below.

The arc is caused to diverge so as to follow the shape of the electrodes, and it attains a length of about a yard before it goes out. At each half-period of the alternating current a fresh arc is formed, so that the result is the equivalent of a triangular sheet of flame.

The furnace gases cool off rapidly as they mount upwards, and they are further helped by a draught of air, which is introduced sideways into the upper portion of the flame and at a lower speed than the main current. This has a kind of suction effect, drawing out the flame sideways, and thus increasing the cooling area. The gas and air leave the furnace at about 700° to 800° C., and contain about 1½ per cent. of nitric oxide.

At Gelsenkirchen there are 24 such furnaces each taking 400 KW. at 4,000 volts. Some larger furnaces of 1,500 H.P. are also at work on this system.

The discovery of calcium cyanamide came about as the result of a research by Profs. Frank and Caro, who were following on the lines of some previous work of Playfair and Bunsen.

As carried out at the Odda Works, the calcium carbide broken into lumps is delivered to crushing machines, from which it passes to mills, in which it is ground fine. The whole of these operations are effected automatically in an air-tight plant, so as to prevent acetylene gas being given off.

The powder is then filled into retorts for the electric furnaces, of which there are 196, each holding 300 kg. When filled, each of these retorts is lifted by an electric traveller, and dropped into its respective electric furnace. It should be mentioned that down the centre of each retort there is a cardboard tube to provide a space for the carbon pencil which takes the current. After these pencils have been fixed in the centre of each furnace, the lids are fastened down and made air-tight.

Alternating current is now switched on, and the temperature is raised to 800 to 1,000° C. The cardboard tube and certain corrugated paper partitions which had been placed in the retorts when the calcium carbide was run in, are burnt up. The spaces thus left allow the nitrogen gas, which is admitted under pressure, to circulate freely through the carbide.

In about 48 hours, including cooling, the whole mass has been made into calcium cyanamide. The furnaces are then opened, the recipients lifted out and emptied, and the cyanamide is ground to a fine powder. Slowly moving conveyors carry it along a tunnel through which a current of air is passing in the opposite direction, so as to aerate the material.

The 196 furnaces turn out about 30 tons of calcium cyanamide containing 18 per cent. of nitrogen per day of 24 hours. The nitrogen gas is supplied by a special Linde plant.

We now come to the question whether it is possible to manufacture these nitrogen products in Great Britain. From a strictly commercial point of view this depends on whether power can be obtained cheaply enough. In such countries as Norway and Switzerland, where there is plenty of water power, and *no coal*, the science of harnessing water powers has been brought to great perfection, and there are several plants which, having inexpensive hydraulic works, are said to produce power at £2 per KW.-year. For the total number of hours in a year £2 is equal to

$$\frac{2 \times 240}{8{,}760} = \cdot 055\text{d.}, \text{ or } \tfrac{1}{18}\text{th penny per KW.-hour.}$$

At Notodden the power is said to cost 33s. per KW.-year, or ·045d. per KW.-hour, and at Odda 30s. per E.H.P.-year is paid for power.

It is interesting to compare these figures with the well authenticated statistics of the largest hydro-electric plant in the world, namely, Niagara. For 1909, 362 million KW.-hours were sold for £210,000, of which 322 million units went to 33 electrochemical and metallurgical consumers at ·133d. per KW.-hour. The remaining 40 million units were sold to electric light and traction consumers at an average price of ·19d. per KW.-hour.

Now, electro-metallurgical works have usually a 100 per cent. load factor, and unfortunately there are very few such works in this country. There is, however, good reason to suppose that waste heat power stations in Great Britain could produce as cheaply as Niagara for such a load factor. Even to-day electrical energy is sold in Yorkshire and Durham at extremely low rates to collieries and ironworks, &c., where the load factor is nearer 33 per cent. than 100 per cent. The actual prices charged do not transpire publicly, but ·25d. per KW.-hour has been mentioned.

Suppose an electric power plant of 10,000 KW. is erected at a cost of £10 a KW., and that on a 33 per cent. load-factor the energy is sold for ·25d. per KW.-hour, on a 100 per cent. load-factor the energy could be sold at ·168d. per KW.-hour.

If, therefore, the initial cost of the plant can be brought down to, say, £6 a KW., which seems feasible, then the cost of electric power should fall to a figure that is comparable with the most favoured hydro-electric plants.

The writer considers that the time is ripe for the establishment of many electrochemical and electrometallurgical processes, which at present are only carried on abroad. Amongst these the manufacture of nitrate manures, and especially nitrogen compounds for explosives, is very important, especially the explosives, for reasons put forward in this paper.

Egham.—The Lord Mayor of London will to-morrow, Saturday, perform the ceremony of laying the foundation-stone of the new power station, in Egham Causeway of the Egham and Staines Electricity Co., Ltd.

THE METER DEPARTMENT.

By "INTERESTED."

Meter-Reading Methods.

There are in use in this and other countries many different methods of recording meter readings; in fact, they are common. Some are very much similar to others, all running im a kind of groove, whilst a few strike out on more or less novel lines, and again, one here and there claims to be "right bang up to date," as they say "over the other side." Below will be found brief descriptions of two arrangements for carrying out this work; one is of a rather peculiar character, whilst the second is claimed (by some) to be right bang up to date and the last thing in meter-reading records. Both systems are retained in use after trials with other forms, so that a certain amount of credit can justly be claimed by them for passing successfully through their initial stages without being discarded in favour of others.

With the first method cards are used, in size about $5\frac{1}{2}$ in. × $4\frac{3}{4}$ in., as per the following pattern (see fig. 1 below). These cards are carried by the meter inspectors in peculiarly formed boxes made of aluminium for the sake of lightness. These are open at the top and have a sliding panel at the bottom. A strap affixed to buttons situated in the centres of the two ends forms a handle for convenient carrying. In bad weather the whole concern can be turned over so as to bring the sliding lid on top, in order to protect the contents from damage by rain. Cards are inserted at the bottom by removing the sliding lid, and a ledge or ridge in the top of the casing prevents them passing right through and falling out. When sufficient cards, which have previously been arranged in order by the meter reader according to his requirements, have been placed therein to fill the box comfortably, the lid is once again put into its place, and the box inverted—*i.e.*, with the sliding lid at the bottom, because in order to drop the cards into their place it will be found handy to turn the box over before commencing operations, and the top card then is ready for writing upon. Directly an entry is made, the card is slipped out from on top, and pushed in at the bottom of the pack through a slot left at the end of the bottom lid, thus bringing to view the card next in rotation. Differently coloured cards are used for various districts, for convenience' sake when sorting.

Electricity Works

Name..... *No.* .....

Address.....

Meter Type ..... *No.* ..... *Size* .....

Date.	Reading.	Advance.	Remarks.	Inspector's initials.

Fig. 1.

The sketch, fig. 2, shows a section through the box when filled with cards, and will convey to the mind more clearly than words the idea intended.

The second method is based upon the loose-leaf principle and is claimed by certain gentlemen "on the road" to be the latest thing in this line. In size, printing and ruling, the leaves are much about the same as the cards described above, and have holes punched at the side or top, as may be deemed advisable, for insertion in loose-leaf-holders. Each cover holds about 100 leaves, and, when filled, is near the size of an ordinary pocket-book. Dozens of different makes of loose-leaf binders are on the market, and I believe every business man to be more or less conversant with the principle, so that an illustration here would be superfluous. One of the big advantages claimed for this system is that only the requisite number of leaves need be put in the cover for 20 calls, or for a whole day's reading. The same can quickly be taken out and transferred to spare binders and passed on to those whose duty it is to make up the accounts, without in any way interfering with or delaying the reading of other meters, as is the case where books are used for this purpose. In order to enable the holder to be opened at the correct page from time to time, a marker is used much like those found in many forms of diaries, either attached to the cover or loose, as may be desired. Call-backs, or, in other

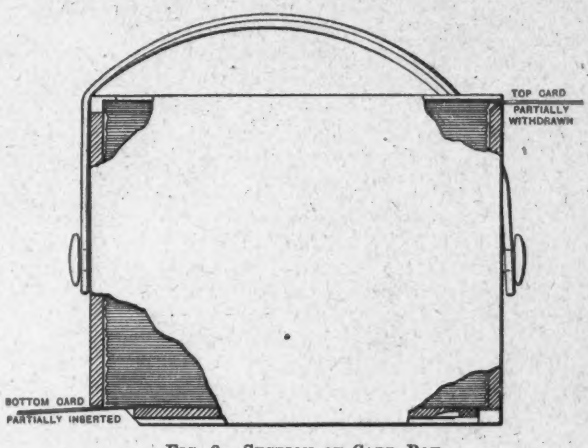


Fig. 2.—Section of Card Box.

words, those readings unable to be obtained in the ordinary round for various causes, are retained in the cover by the meter inspector, ready for use when he is next in that neighbourhood. Books defeat this purpose, inasmuch as the accounts for those meters actually read have all to be made out before the book can be returned to the reader for the purpose of his call-backs. Of course slips of paper could be used, or even a common pocket-book, for these call-backs when only one or two are in question, but in a large undertaking of any kind where consumers run well into four figures, and the number of premises which have to be visited a second or third time is considerable, these slips of paper and odd notes in books are unsatisfactory and a source of trouble.

The main disadvantage with the loose-leaf system is that paper is not so convenient to handle as cards. Cards lend themselves to quick handling, whereas thin sheets are liable to crumple and tear if used without due care. Thin linen cards answer admirably in loose-leaf covers, and keep in better condition than do stout sheets of paper, but their weight and the space occupied by them in the holder are against them. Cards could have been quite easily introduced in the before-mentioned loose-leaf covers, but the true system as worked in actual practice uses paper leaves, and this is the reason for specifying them here.

Consumers' Complaints.

Prompt and proper attention to complaints from consumers is essential to the well-being of any electricity supply station. Dissatisfied customers are likely to show up as very bad advertisements; therefore, for that reason alone, it should be part of the business of every works to pay careful attention to all complaints, whether received by letter, telephone or verbally. During the periodical visits of the meter reader to consumers' premises, many little complaints are received by him, which, if allowed to pass without attention, are likely to grow into sore grievances. Care should be taken that all these secure prompt attention, and that suitable answers are forwarded without delay. A polite note setting forth all the points in question may prove the means of retaining a customer, where otherwise he might continue in an offended spirit, and ultimately revert to the rival gas. On the other hand, satisfied customers are likely to extend their installations, especially if a cute "publicity" man is on the staff of the supply works, who will keep an eye open for all possibilities. Again, the satisfied consumer can be likened unto the well-known show-card—a good advertisement.

One useful method of dealing with complaints is as follows:—Directly upon receipt of a complaint a card,

such as is illustrated (fig. 3) below, is filled in by the person in charge of the office, and attached to the letter, meter reader's report or telephone message, and passed on at once to the engineer in charge of the consumers' department for attention. When dealt with, and details recorded on the card, it should be brought before the chief

COMPLAINT.

Name .....

Address .....

Date received .....

Nature of complaint .....

.....

Date answered .....

Text of reply sent .....

.....

.....

.....

Engineer .....

FIG. 3

or chief assistant, so that he will not be in complete ignorance of the facts should any further grumbling take place. Prompt attention is an important factor which is sometimes neglected. When dealing with complaints regarding consumption of energy and such like, a record after the manner shown here will be found an advantage (see fig. 4). In the illustration I have assumed that meters are read monthly, and that part of the inspector's time between readings is occupied by filling in the necessary details, as shown in the diagram. Books on the loose-leaf principle are recommended here in preference to fast bound ones. Each month the head of the consumers' department should make it his business to inspect the books and initial every account. This enables the engineer to keep in close touch with the accounts, and, naturally, when any appreciable fluctuation is noticed, inquiries will be instituted as to the cause. A few special visits in order to inspect any instruments on premises of consumers whose average daily consumption shows a decided increase or decrease may prove the saving of many complaints in that direction. Accounts based on estimated amounts of energy consumed are always sources of contention, and by the above method of keeping in touch with meter readings no meter can remain long in a faulty condition without its being noticed.

METER READING ANALYSIS.

Date. 1911.	Reading.	Units consumed.	No. of days since last reading.	Units per day consumed.	Engineer's initials.
May 27th	198	—	—	—	—
June 28th	463	265	32	8·28	A. B.
July 26th	711	248	28	8·85	A. B.

FIG. 4.

These are small matters in themselves, but it has often been proved in practice that minor points such as these are well worth a little time and trouble spent upon them.

The Aerophone and Aeroplanes.—It is reported in the *Daily Express* of the 25th inst., that on Saturday last Mr. Grindell-Matthews, with the wireless telephone apparatus which he has devised, and which is known as the aerophone, succeeded in communicating with Mr. C. B. Hucks while the latter was flying in an aeroplane at Cardiff. This is the first occasion, we believe, on which wireless telephony has been carried on under these circumstances, and the inventor is to be congratulated on his success. So far as the report goes, speech was effected in one direction only—from the ground to the aeroplane.

The Grindell-Matthews Wireless Telephone Syndicate has been formed to put the invention on the market.

THE NEW SERVANT.

BY "MAUD."

AT one time or another ladies who have to manage and ensure the sweet running of their households have been troubled by that most vexatious question known as the servant problem, which crops up at all sorts of undesirable periods and upsets the general routine of things. It is not of much use waiting whilst the legislature or the elementary schools endeavour to mitigate it; as the former does not like female labour questions, and the latter are endeavouring to make a generation of school teachers. It therefore behoves ladies to use every new appliance which will tend to lessen the amount of daily work necessitated in the home, by our usual methods of living.

Before one thinks of spending an amount of money on a holiday, the question is carefully considered as to where to go either for health or pleasure to ensure getting the best ultimate results. So it should be with the household; there should be time spent in thinking out how to best spend money to reduce the amount of cleaning necessary in the home. Now I claim that there is one thing, if thing it can be called, which when introduced into the home will immediately effect untold savings. As I am writing within the pages of an electrical paper, it will easily be foreseen that I refer to electricity. I have heard it argued by people, quite seriously, that electricity is in its infancy, and when it is properly understood it will be used for everything. Now, although neither electrical appliances, nor, for that matter, anything else is perfect, or ever will be, I think electricity can be likened to a child who has rapidly grown with the flight of time into the strength of youth; at least, so it appears to me when I think of the things it can do in my home.

Undoubtedly the first thing that electricity will be used for in the home will be for lighting. Now, it is my experience that when one has a cold each of one's friends will recommend a different remedy for its cure until one assumes the calm demeanour of the martyr, listens to all, and then pleases oneself.

So with your lighting question; hear all that your friends have to say and then please yourself. One of the first things one has to decide is the question as to the amount of light needed in the different rooms in the house. This should not be such a difficult question in a house where gas is already installed, as one has the existing lights to go by as a guide. Suppose that gas is the offending illuminant, and owing to your having been worried by the persistence of mantle travellers, whom you have doubtless disposed of by purchasing a trial mantle, you have doubtless become quite conversant with the various types of mantles, and ultimately arrived at the conclusion that the inverted type gives the best light. These mantles when carefully adjusted, a by no means simple process to the uninitiated, are claimed to give about 70 C.P., a claim which I have seen repeatedly disputed after the mantle has been in use a few times, therefore you will be about correct if you take it that your inverted mantle gives you about 45 C P.

Now, in your dining room you will probably have two or three such lights situated over the table, and shaded so as to give a nice soft effect. Therefore, it becomes an easy matter to decide what lights you require. If the existing lights are sufficient, choose electric lamps of the same size, or, better still, think of how you use the room in the ordinary way; and then have just sufficient lights fixed over the table to give a pretty effect, but don't forget a handy light fixed in your favourite cosy corner where you can read your fashion paper or book whilst your husband has his paper and pipe in comfort. If you have not inverted mantles, I believe it is usual to reckon on the upright mantle as giving 38 C.P. and the ordinary bat's-wing burner 11 to 16 C.P. Therefore, reasoning upon these figures and lines, it becomes an easy matter to tell the electrician who is to install the light your exact requirements.

I believe in a large number of towns the electric supply people have canvassers who are fully qualified to give you free and valuable advice, which will be of use to you in having the lights fixed in the most economical manner, both in first cost and, more important still, with regard

to the amount of electricity you will use. As it will be seen that the question of the amount and position of the lights is one chiefly of common sense, there may be one or two points upon which a little information by one who has used electric light for years may not be out of place. In your drawing-room have a switch and plug fixed, as then you can easily fix and use an electric kettle or fan, which you will be sure to purchase. Have a similar switch and plug fixed in the two largest bedrooms, dining-room and kitchen, as they will be most useful, and you can connect to them numerous small electric labour and trouble-saving appliances, which can easily be removed from room to room, and which take such a small amount of current that they are economical even where the current used is charged for through the lighting meter.

Whatever you do, make sure that you use metallic-filament lamps, as these take about one-third of the current which the old carbon lamps take, and they give a lovely light, just like sunshine. If you want to get an illuminant which will give a nice soft light, but one which will be equal in all parts of the room, I should recommend the use of Holophane glass bowls. I have one of them fixed near the ceiling in my drawing-room, which has a 100-C.P. metallic-filament lamp fixed inside it, and which lights the room evenly all over, and quite as well as it is lit in the daytime. There is one most useful appliance that should be found in every electrically-lit home, and that is the new Watkin switch, which enables one to turn down the electric light just like gas. This is most useful in halls and bedrooms, as it effects enormous savings, and at the same time enables the light to be subdued and adjusted in the sick room.

When counting the cost of lighting your house by electricity as compared with any other form of illuminant, do not be misled by considering only the cost of the electricity used. First of all, taking the comparison on the basis of electricity cost alone, I find that, comparing light for light, the cost of electricity does not exceed the cost of gas lighting, and I am aware of a number of cases in which it is cheaper. In most houses, owing to the cumbersome nature of gas fittings, there are as few lights as possible, but when this objection is removed, due to the convenience and artistic nature of electric fittings, the householder naturally increases the number of lights, and then, of course, the electricity bill is sure to be larger than the old gas bill, but the slightly increased cost is far outweighed by the increased comfort. Indeed, in a number of houses it would be quite possible to increase the number of lights, and by the judicious use of switches, and especially regulating switches, the cost would not be increased.

Apart from the question of the cost of the electricity alone, there are savings effected by the use of electric light which really are larger than the annual electricity bill. First and foremost is the question of decoration. If the house is to be clean and attractive, then it is quite essential in rooms regularly used where either gas or oil is the illuminant that the ceiling be whitewashed or repapered each year, and at least every two years the wall paper wants renewing or recolour-washing. This is usually a great expense and inconvenience, and the total cost of doing this, including the cost of labour in getting straight again, will be found to be about half the annual electricity bill. Whereas if electricity had been used, both the ceiling and the walls would have lasted for years. Then again, the house as often as not is not your own, and you are therefore expending money on the property of others; but in addition to this, think of the damage that the obnoxious fumes of the gas or oil lights do to those treasures of your own, books, paintings, leather work, draperies or curtains, some of which, for sentimental reasons, are dearly prized, and which, while you carefully keep the children and maids from them, you allow to be spoilt by the nasty fumes referred to above. These cannot be replaced except at a large cost, and surely their value is far above the mere paltry cost of the electric light which, whilst it lights your home without the usual jumpiness of the gas, does not spoil your possessions or those of the landlord.

Before leaving the question of the cost of electric lighting, it is most essential that the personal part of the aspect should not be forgotten. I claim that electric light is the most healthy illuminant that can be used, chiefly because it does not give off fumes, such as those of gas or oil, which, when breathed in large quantities, are most injurious to health. If you have any doubt of the presence of these, go into a room that has been lit with gas or oil for a few hours, take a pair of steps and climb high enough to sample the air near the ceiling, and you will then decide for yourself if you can allow such a gigantic evil in your home. At the same time, never forget the safety of electric light when compared with gas or oil. Think of the large number of gas explosions and oil lamp fires that occur annually and compare them with the number of fires actually due to electricity in the home, and you will soon be convinced as to which is the safer for you.

I will now leave this important question of lighting and turn to the new sphere in the home which electricity is making solely its own.

(*To be concluded.*)

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

FIJI.—The Customs Authorities have recently revised the tariff on goods imported into Fiji, so that all electrical goods which may not be admitted free of duty under the free list, are now dutiable at the rate of 15 per cent. *ad valorem*, instead of 12½ per cent. *ad valorem* as was previously the case. In this connection readers should refer to the information as to duties in Fiji published in the ELEC. REV. of July 23rd, 1909.

SWEDEN.—According to notices published in the Swedish Press, the Swedish Customs Administration desires to draw the attention of foreign exporters of machinery to Sweden to the fact that, in accordance with the new Customs Tariff Law which is to come into force on December 1st next, machinery imported into Sweden on and after that date must be accompanied by a statement of the gross and net weight of every package, and a full specification of the contents of each package, as well as all information of a nature to facilitate the assessment of duty.

Special attention is called to the following general provision applicable to the category "Machines and Apparatus" in the new Swedish Tariff:—When machines imported in a "knocked-down" state (*i.e.*, taken to pieces) are declared for clearance or warehousing, the owner must supply an explanatory statement and specification of the parts, together with a drawing showing how the parts together form a machine—so far as these may be required for the guidance of the Customs.

Information as to the rates of duty proposed to be levied under the new Tariff referred to above has been published in the ELEC. REV.

FRANCE.—The French Customs Authorities have issued the following decisions which affect the classification of certain electrical goods for duty purposes:—

Cables imported for submarine telegraphic or telephonic lines, submarine portion, free; portion installed on land from the limit of the water to the point of junction, dutiable as "wire and cables insulated, for electricity."

Transmission pulleys furnished with other parts, especially axles or brackets, dutiable as "detached parts of machines according to class."

Transmission pulleys with toothed wheel forming part of the pulley, dutiable as "transmission pulleys."

Note.—For details as to the actual rates of duty leviable under the denominations referred to, readers should consult the statement of duties published in the ELECTRICAL REVIEW.

JAPAN.—The enforcement of the new Japanese tariff does not involve any change in the procedure which has hitherto been followed with regard to certificates of origin for goods exported from the United Kingdom to Japan. It is, however, no longer necessary to forward certificates of origin for those goods which figured in the former Japanese "Conventional" tariff, but are not included in the present "Conventional" tariff. Information as to the electrical goods affected by the new "Conventional" tariffs, *i.e.*, special tariffs arranged as a result of treaties, has been published in the ELECTRICAL REVIEW.

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

20,078. "Electric tramway trolley standards, current-collecting devices and the like." A. Colman. September 11th.

20,100. "Electric traction." R. C. Sayer. September 11th. (Complete.)

20,106. "Electric telegraph systems." W. S. Steljes. September 11th.

20,107. "Typographic and like receiving instruments for electric telegraph systems." W. S. Steljes. September 11th.

20,149. "Electric contact devices for clock movements." L. P. E. Appoullet. (Convention date, September 9th, 1910, France.) September 11th. (Complete.)

20,161. "Automatic electric circuit-breakers." J. Cuculic. September 11th. (Complete.)

20,170. "Electric switches." A. F. Berry. September 11th.

20,171. "Electric switches." A. F. Berry. September 11th.

20,172. "Electrically-heated cooking ovens and the like." A. F. Berry. September 11th.

20,201. "Method and arrangement for producing electrically luminous letters, inscriptions, lines, figures and the like by means of high-tension discharges." A. Laszlo. (Convention date, March 16th, 1911, Germany.) September 12th. (Complete.)

20,223. "Incandescence bodies for electric glow-lamps." E. Hurwitz. (Convention date, January 30th, 1911, Germany.) September 12th. (Complete.)

20,224. "Process for the manufacture of electric metal-filament lamps." K. Schwab. (Convention date, May 4th, 1911, Germany.) September 12th. (Complete.)

20,262. "Shade-holders for electric and other light fittings." W. J. Wilson. September 12th.

20,263. "Electrical time-limit devices." British Thomson-Houston Co., Ltd., and J. J. Ash. September 12th.

20,264. "Electric heating devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 12th.

20,268. "Electrically-operated time-indicating devices." L. J. Aron and C. E. Harrison. September 12th.

20,295. "Manufacture of tungsten and incandescence bodies therefrom." E. Scharrer and G. Ludecke. September 13th.

20,298. "Direct-current motors." F. Vlaminck. September 13th.

20,302. "Method of and means for voltage regulation in stage transformers." H. Richter. September 13th. (Complete.)

20,311. "Double-pole electrical switches." Midland Electric Manufacturing Co., Ltd., and W. L. Barber. September 13th.

20,314. "Apparatus for connecting conducting wires, cables, and the like." Baron A. del Marmol, G. Voos, Baron W. del Marmol and W. Grisard. September 13th. (Complete.)

20,340. "Relays for strengthening weak electric currents." J. Schiessler. September 13th. (Complete.)

20,342. "Conjunction of cords or wires with electrical apparatus." G. St. J. Day. September 14th.

20,355. "Cooling commutators of dynamo-electric machines." A. D. Railing and T. Duckitt. September 14th.

20,380. "Manufacture of incandescent electric lamps and apparatus therefor." K. Schwab. (Convention date, January 11th, 1911, Germany.) September 14th. (Complete.)

20,388. "Electrically-operated boat hoists." J. Fielding. September 14th.

20,402. "Electromagnetic valves for gas apparatus." E. Telliер and Compagnie Anon. des Allumeurs Extincteurs du Gaz a Distance, Systeme Gote. September 14th. (Complete.)

20,409. "Arc-rupturing devices for electrical apparatus." Allgemeine Elektricitats-Ges. September 14th. (Convention date, September 15th, 1910, Germany.) September 14th. (Complete.)

20,429. "Apparatus for regulating electric circuits." H. A. Carney and J. A. Pearn. September 15th.

20,434. "Diaphragms of telephonic receivers and like instruments." A. Marr. September 15th.

20,437. "Production of tungsten filaments." J. A. Scoular. September 15th.

20,442. "Brushes for dynamo-electric machines." H. Cooch. September 15th.

20,451. "Telegraphic relays." S. G. Brown. September 15th.

20,452. "Electric measuring instruments." H. W. Brown. (Convention date, October 8th, 1910, United States.) September 15th. (Complete.)

20,512. "Control of alternating-current electric motors." R. H. Barbour. September 16th.

20,523. "Electrical transformers." E. Haefely. September 16th.

20,524. "Electrical transformers." E. Haefely. September 16th.

20,534. "Electric controllers." H. R. Canfield. (Convention date, September 21st, 1910, United States.) September 16th. (Complete.)

20,555. "Electric cooking ovens." C. G. Nobbs and C. G. Nobbs, Jun. September 16th.

20,565. "Portable electric lighting systems." H. H. Hirsch. September 16th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1910.

Electric Transformers. H. F. Berry. 12,355. May 19th.

Wattmeters. E. Weston. 17,091. July 18th.

Electric, Hot Air and Steam Heating and Ventilating Systems for Railway Carriages and the like. J. Stone & Co. and A. H. Darker. 17,537. July 23rd.

Means for Electrically Transmitting Orders or Signals and for Indicating their Nature and the Points of Transmission. H. Quertier. 19,701. Augus. 23rd.

Electrical Transmitting, Printing, Indicating and Recording Apparatus. N. Quertier. 19,703. August 23rd.

Electric Resistance. M. Kallmann. 19,968. August 27th. (August 31st, 1909.)

Current Collectors or Contact Columns for Electric Cranes and the like. Allen, West & Co. and W. J. Moggridge. 20,107. August 29th.

Electric Time-Switch for Lighting Circuits. J. Liddle. (Rudolf Buderer and Co.) 22,760. October 1st.

Supporting Wire for Metal Filaments of Electric Lamps and a Method of Manufacturing the Same. L. Mond. 23,404. October 10th.

Mechanism Operated by the Passage of a Railway Train or Vehicle for Actuating Electric Switches. W. R. Sykes Interlocking Signal Co., J. C. Sykes and R. W. Tarrant. 23,983. October 15th.

Electrical System for Indicating an Alarm of Fire or such like Simultaneously at any Required Number of Points or Stations. A. W. Brown. 24,188. October 19th.

Process for Decarbonising Metallic Filaments for Incandescent Electric Lamps. Westinghouse Metallfaden Glühlampenfabrik Ges. 24,637. October 24th. (November 12th, 1909. Addition to No. 2,983 of 1910.)

Electric Annunciating Apparatus. H. G. Alther and C. W. Gill. 25,368

Selective Electric Signalling. J. T. Irwin. 29,206. December 16th.

Electrical Heating Apparatus. A. F. Berry. 18,115. July 29th.

Control of Electrically Operated Lifts, Elevators and the like. H. C. Walker and R. Waygood & Co. 20,118. August 29th.

Electrically Driven Ring Spinning Machines. A. C. Eborall and Brown, Boveri & Co. 20,249. August 30th.

Receiving Apparatus for Wireless Telegraphy. Marconi's Wireless Telegraph Co. and H. J. Round. 20,441. September 1st.

Railway Block Telegraph Indicator. A. T. Blackall and C. M. Jacobs. 21,534. September 16th.

Electromagnets. Soc. Anon. "Phi." 23,881. October 14th. (August 6th, 1910.)

Electric Switches. J. H. McLean and W. L. Madgen. 24,994. October 27th.

Spark-Plug Insulations. A. Herz. 25,539. November 3rd. (Convention date not granted.)

Variable-Speed Alternating-Current Induction Motors. British Thomson-Houston Co. and J. Martin. 25,683. November 4th.

Electric Switches. M. D. Scott. 25,766. November 5th.

Electric Hoists or Pulley Blocks, Winches and the like. Adamson, Ramsbottom & Co. and H. Ramsbottom. 27,299. November 23rd.

Electric Switch with Quick-Make and Quick-Break Action. J. McFarlane. 27,825. November 30th.

Telephone Call Recorders. A. J. Boult. (Mills.) 28,368. December 6th.

Means for Holding or Detaching Electric Wires on or from Insulators. Alfred Wiseman, Ltd., and J. W. Harris. 29,114. December 15th.

1911.

Telegraphy. P. B. Delany. 55. January 2nd.

Insulating Compounds. British Thomson-Houston Co. (General Electric Co.) 176. January 3rd.

Rotary Field Induction Generators. Siemens Bros. Dynamo Works. (Siemens-Schuckertwerke Ges.) 223. January 4th.

Electrical Chest-Warmer. A. Selvatico. 1,481. January 19th.

Electric Motors. J. C. Crawshaw and Phœnix Dynamo Manufacturing Co. 1,543. January 20th.

High-Frequency Alternator for Radio-telegraphic and Radio-telephonic Plants. E. Girardeau. 3,948. February 16th. (May 9th, 1910.)

Automatic Regulators for Electric Circuits. W. E. Lake. (United States Light and Heating Co.) 5,490. March 4th.

Apparatus for Measuring the Relation of Two Electric Currents. J. Carpentier. 5,961. March 9th. (March 18th, 1910.)

Electric Flame-Tight Fuse and Switch Boxes. W. Creswick and J. Bentham. 9,097. April 11th.

Electric Motor Controllers. Siemens Bros. Dynamo Works and E. Schupp. 9,606. April 20th.

Arc Lamps. C. G. Perez. 11,275. May 10th.

Process for Treating Finely Subdivided Substances by Electric Osmose. B. Schwerin. 11,626. May 13th.

Spark Plug. F. E. Harpst. 11,811. May 16th.

Telephone Mouthpieces. G. S. Bennett. 12,200. May 20th.

Electrical Relays. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 12,295. May 22nd.

Controllers for use in Connection with Electric Motors. Electric and Ordnance Accessories Co., J. R. Gardner and M. R. H. Mueller, 14,867. July 26th. (Divided application on No. 17,349 of 1910. July 21st.)

Control of Electrically Operated Lifts, Elevators and the like. H. C. Walker and R. Waygood & Co. 15,983. July 10th. (Divided application on No. 20,118 of 1910. August 29th.)

Joints or Couplings for Piping and Electric Cable. J. T. Catt. 744. January 11th.

Single-Wire Telephone Systems. C. J. Ellison and W. J. Thorrowgood. 3,730. February 14th.

Interrupters for Electric Ignition Machines. Firm of Robert Bosch. 7,682. March 27th. (December 3rd, 1910.)

Electric Arc Lamps for Alternating Current. Korting & Mathiesen Akt.-Ges. 10,290. April 28th. (April 30th, 1910. Addition to No. 25,706 of 1909.)

Electric Photographic Printing or Copying Machines. J. Halden & Co. and H. R. Watts. 10,701. May 3rd.

Gas Lighting in the U.S.A.—The danger of asphyxiation from the accidental continued inhalation of illuminating gas is very generally understood, but the poisonous effects of so-called water gas are, perhaps, not so well appreciated. The best quality of artificial illuminating gas is a mixture of a gas obtained by the distillation of coal in retorts with water gas. Water gas is made by blowing steam through red-hot coke, and is an extremely poisonous product, for the reason that it contains a large percentage of carbon monoxide. It is stated on good authority that breathing a mixture consisting of 99 per cent. of pure air and 1 per cent. of water gas will produce fatal effects within a very short time. Water gas is cheaper to manufacture than high-grade illuminating gas, and its illuminating value is good. The average consumer has no way of telling whether the product supplied him is standard illuminating gas or water gas. Hence, because of the better profits derived, the gas manufacturer frequently supplies the latter instead of the higher grade gas.

Two members of the teaching staff of a leading eastern technical school have recently published the results of a series of investigations on the relation of illuminating gas to the public health. The report expresses surprise and alarm at the prevalence of ill effects resulting from the widespread commercial use of water gas. It is asserted that in some States the deaths from gas poisoning are as numerous and as frequent as those from many of the common diseases. The remedy suggested is immediate and stringent legislation to prohibit the sale of water gas to the public.—*Electrocraft.*